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TRANSCRIPT OF RECORD.

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1906

No. 3, ORIGINAL.

THE STATE OF KANSAS, COMPLAINANT,

vs.

THE STATE OF COLORADO ET AL., AND THE UNITED STATES, INTERVENOR.

IN EQUITY.

VOL. II.

BILL FILED MAY 20, 1901.

4596 J. C. NEEDHAM, Washington, D. C.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I reside in Modesta, Stanislaus county, California. I am a member of Congress and have been for the last six years. My
4597 term began on March 4, 1899. I am very generally acquainted with the conditions prevailing in California, particularly with the conditions in my congressional district. It is undoubtedly true that a large amount of property in California, and in my district particularly, has been created and exists by reason of irrigation. There are two counties in my congressional district that have been developed by irrigation—Fresno and Kings counties. Fresno county is probably as good a county as we can take as an example in the State to show its development by reason of irrigation. Prior to the development of the irrigation possibilities of this county it was largely given over to sheep and stock raising and some
4598 wheat raising, and then when the people there learned that they could use water for irrigation purposes they did so, with the result that the value of all kinds of property doubled and trebled, and in some instances it has gone up many times its former value.

In respect to what the land was worth prior to its being irrigated, the first stage was the stock stage; that was before we commenced to raise wheat. During that period land was worth $1.25 to $4 or $5 an acre. In answer to your question as to what land now in Fresno county under irrigation is worth, I will say that I could perhaps describe that a little better by stating that land that is susceptible of irrigation but is not prepared for irrigation would probably be worth as a minimum $50 an acre if it is prepared for irrigation, and say it is in alfalfa, it would be worth about $100 an acre; and then if it is in vineyards, for raisins or fruits, it would be worth all the
4599 way from $150 to $500, depending on the nearness to the city, etc. While I have not the statistics, I think about one-third of Fresno county has been put under irrigation.

Yes, land can yet be added to the irrigated part of Fresno county by using the waters for irrigation purposes and by storing the flood waters. I think it would be possible by putting in storage in the mountains to double it.

4600 We have had to depart in actual practice a good deal from the doctrine of riparian rights in order to have the development we have made, and under that doctrine of riparian rights it would be difficult to make any future development. It would practically prevent future development if strictly enforced.

If the irrigated area were confined within half or three-quarters of a mile from the center of the stream, I do not think it would be too strong to say it would almost destroy development—practically.

I am generally acquainted with the doctrine laid down in the celebrated case of Lux vs. Haggin by the supreme court of the State of California. The doctrine laid down in that case has been departed from a great deal, because when that decision was rendered we did not realize the value of water, and as the irrigated area grew the people realized that they could not follow that doctrine strictly and develop as they ought, and consequently the decision itself has been next to reversed. It has been practically re-
4601 versed by the supreme court itself, and nearly every subsequent decision, by implication, at least, in the language of the court, has disregarded the decision. The doctrine of prior appropriation and the application of water to beneficial use is in effect the doctrine that is now in force in California, practically, and that is illustrated in our Wright law which the legislature has enacted.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

As to any single case in which the doctrine of Lux vs. Haggin has ever been reversed, nullified or abrogated, I have stated in my answer that while it had not been directly reversed yet the language of the supreme court in subsequent decisions—the fair implication to be drawn from that language is that the decision is disregarded by the court, and if it was a new proposition there is no question but what the same supreme court would reverse it. I cannot now, after being out of practice six years, name any specific case where the supreme court of California has ever intimated that it regretted the decision in Lux vs. Haggin, but I could easily find it.
4602 Any lawyer can easily find lots of them in which the doctrine has been modified. By going to the library I could find the cases myself.

I think it is true that our State has more varied physical features than any other State in the Union. We have parts of our
4603 State which are known as purely a humid climate and we have other parts known as semi-arid, and a third section that is known as the arid climate, but we do not irrigate in all three of these sections.

As to those parts of the country that have been reclaimed by irrigation, I have not looked into it enough to know particularly whether that was done to the destruction of prior appropriators or prior users of water. (Objection by defendants.) I do not think it was done in many cases. I do not think that a subsequent appropriator has prior rights over a prior appropriator simply for the reason that the subsequent appropriator is farther up the
4604 stream. (Objection by defendants.) It might be in some cases and it might not be in others that a subsequent appropriator could obtain the right to use waters solely by going farther up stream and appropriating them at that place. I do not mean for my

answer to be taken to indicate that a subsequent appropriator might simply go up the stream farther than a prior appropriator and thereby get a prior right over the prior appropriator.

Under the Wright irrigation law where we organize into districts, where everybody unites in a district and votes to form a district and we get a source of supply, the water is for the equitable use of everybody in the district there up and down the stream, and of course we recognize to an extent the question of prior appropriation,
4606 especially as followed up by beneficial use.

Cross-examination on behalf of defendants.

By Mr. HYAT:

At the time of the decision in Lux vs. Haggin I meant to say that the court did not at that time appreciate the development of irrigation in the State, and the developments subsequently to that decision have shown that the water is more valuable than the land in some instances. Of course land without water would not be worth anything, and there are a great many areas in our State where if you had no water the land would be almost valueless. And the development of irrigation in our State has also shown that the productiveness has been very much increased by what is called
4607 intensive farming. In some localities where they raise vegetables, for instance, a few acres will support a family. A vegetable or truck garden of four or five acres would support a family. But the average farmer I should say in irrigated regions would use in the neighborhood of forty acres or more. It is generally supposed that a man would prefer to have forty acres of irrigated land to one hundred and sixty or even more land in the humid regions of California. Crops are a great deal more valuable in the arid region, and experience teaches that irrigation
4608 tends to reduce the number of acres held by each individual very greatly. The tendency is to smaller holdings and to increase the population very rapidly. I think it is undoubtedly true that experience in California has shown that a great many more acres of land can be irrigated now than it was thought possible to have irrigated say twenty or twenty-five years ago. There are regions where we sub-irrigate, that is where we simply run the water through ditches without actually applying it to the surface of the land. I think in some portions of the State we exhaust
4609 all the water for the purposes of irrigation and afterwards a portion of that water so used returns to the stream and is used again for irrigation. I don't know much about that, though. I know there are regions where the sub-irrigation is such, that is, the attraction under the soil from ditch to ditch is such that you do not have to apply any water at all on the surface, and all they do is to run the water through the main ditches to irrigate the land between those ditches. For instance, that is largely true in Kings

county. The decisions of our court are general, for the whole State.

4610 Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

It is practically true that since the decision in Lux vs. Haggin it has been conclusively shown that the application of that doctrine to the State of California would practically have prevented any further development along agricultural or horticultural lines. It is true and has been demonstrated in California that there is an irreconcilable conflict between the doctrine of riparian rights and the doctrine of prior appropriation and application to beneficial use of the waters of the streams of the State. No sir, it is not possible that these two doctrines can exist in the same place at the same time. Of course the decision of the supreme court necessarily applies to the whole State. The locality which gave rise to the case of Lux vs. Haggin is Kern county. That is not in my district. There was very little irrigating being done in California at the time that decision was rendered. Since that time the irrigated
4611 area has grown wonderfully. As I recall it, of the land which was in controversy in Lux vs. Haggin, not much of it was productive by rainfall. That is in an area where the rainfall is very slight.

4612 HENRY C. HANSBROUGH, Washington, D. C.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I reside at Devil's Lake, North Dakota. I have been United States Senator from that State since March, 1901. I am chairman of the Senate Committee on Public Lands. I was a member of the committee of seventeen which considered and framed originally the act known as the reclamation act of 1902. Yes, when that bill passed the Senate it was referred to and reported by the committee. I was authorized by the committee of seventeen to lay the bill before my Committee on Public Lands and to secure a report from that committee, which I did. This act is applicable to the western part of North Dakota. A country of twenty-five or thirty miles wide in the extreme western part of the State might be termed arid; then there is east of that for a distance of fifty or seventy-five miles what would
4613 come within the designation of semi-arid land. All of the land would produce agricultural and horticultural crops if it had a sufficient supply of water; that is, all that could be cultivated under any circumstances. Of course there are some portions that are hilly, and the Bad Lands. In the arid portion of the State we cannot raise anything without artificial moisture. Yes, some small

portions of the arid section have been reclaimed by irriga-
4614 tion. Oh yes, a very large portion of western Dakota can be added to the irrigated area by using the waters of the streams there and by storing the flood waters. It is my opinion that by a system of dams eight or ten million acres of land could be irrigated in North Dakota, that is, by damming the Missouri river as well as the Yellowstone and using the flood waters of those streams and their tributaries. The land is not worth now above $1 an acre in the arid section. By a complete system of irrigation that land would be worth at least, I should say, from $30 to $50. This additional land would support a vast population. Less than half
4615 a section would support a family of five. I think eight or ten million acres could be reclaimed by a proper system of dams on the Missouri and Yellowstone rivers, and this would support, directly and indirectly, an additional population of a million or more. I had in mind in the statement which I made in respect to eight or ten million acres of land being reclaimed the establishment of irrigation works in both the arid and semi-arid regions, because if you put a large dam across the Missouri river, that would be in the semi-arid part of the State. I would not think that the lands in the semi-arid portions of the State that are not under irrigation are worth more than $1.25 per acre at the present
4616 time.

If it should be declared that the waters of the streams in North Dakota should be allowed to flow undiminished in quantity and unaffected in quality, the effect would be that there would be very slight development as a result. The future development of the semi-arid and the arid portions of North Dakota depends entirely upon the taking of the waters of the streams for irrigation purposes and upon the impounding of the flood and other
4617 waters for such purposes. Should it be declared that the irrigated lands be confined to those bordering on the stream or within one-half or three-quarters of a mile therefrom, the effect would be that along the Missouri river where there are what are known as table lands a considerable amount of that land could be irrigated by dams not very difficult to construct, but to get it out on the higher lands you would have to have an enormous dam. I don't know as to the extent of the lands that could be irrigated say a mile on each side of the streams, but there is quite a quantity of land there that belongs to that class of land known as table land that lies from four to ten feet above the normal stage of the river. In some places that water can be brought out onto those table lands by gravity processes. I do not think, however, that one-tenth as much land could be reclaimed as can be reclaimed if you are allowed to take water far from the river and from the banks of the river.

Yes, I took quite an active interest in the framing and passage of the act of Congress known as the reclamation act. I was very much

interested in it. I believed that the future development of
4618 the arid region in this country depended upon the passage of some such act as that—the adoption of a policy of national irrigation. I do not think that the reclamation act could be effectively enforced and administered if the irrigated area should be confined to the lands bordering on the river, within one-half or three-quarters of a mile thereof. I do not think that the expectations of the bill could be realized in such case. From the information submitted to our committee, my judgment is, in respect to the number of acres which can be reclaimed under the operation of that act, that it is not far from a hundred million acres in the entire region involved or mentioned in the bill.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

The eastern part of North Dakota, known as the Red River valley, was settled first. It is a wonderful wheat country, and crops are raised by natural process and by natural rainfall and not by irrigation there. The Red River *on* the North is the dividing line between Minnesota and North Dakota. That is the only stream of consequence. There are some streams running into this north of the boundary of Canada. There are not many streams that could flow from Canada into Minnesota, because there the water flows north. We always say
4620 "down north" in our country, and "up south." The Red river takes its rise in Minnesota about half way between the north and south lines of Minnesota, in the western part of that State. There are rivers that rise in Canada and flow into North Dakota. There is the Mouse river, which rises in Canada and flows around in a horse shoe bend like into North Dakota and then goes back into Canada, very much as the Milk river does in Montana. The streams in southeastern North Dakota and indeed in all of eastern North Dakota flow into the Red river and then flow north into Canada to Lake Winnipeg. In the western part of North Dakota the principal stream is the Yellowstone, which rises in Montana and
4621 empties into the Missouri some ten or fifteen miles east of the western line of the State of North Dakota.

The Missouri river rises in Montana and flows perhaps 500 miles through North Dakota, then through South Dakota and into the Mississippi. Oh yes, there were settlements upon the Missouri river in North and South Dakota before the irrigation interests began in North Dakota. Some of the earliest settlers in what was known as the old Territory of Dakota came in there along the Missouri river and settled along those table lands I spoke of awhile ago in both North and South Dakota early in the '70's. I supppose those settlements were made there because of the water transportation which admitted of the passage of the people north and south. It was not because of the proximity of water for the purposes of irrigation because at the time of these settlements irrigation was an unknown

quantity. It was their supposition that there was sufficient
4622 rainfall to warrant their settlement and they settled along the rivers naturally. This is the natural development generally, the same as you will find the principal cities along the streams wherever you go. As I said, these settlements through North and South Dakota were before there were any irrigation interests in North Dakota and long prior to the agitation in this country on the subject of irrigation. Of course irrigation was known in a general way, because they were practicing it in California and other western States at that time. These early settlers pro-
4623 duced very little property interests. They drove their stakes there and built their small shacks and tested the climate and conditions and got tired of it and went away. There were some trading points built up along the Missouri river in these States. Pierre is the capital of South Dakota and Bismarck the capital of North Dakota, each of them being about 4,000 population, each of these towns being settled early in the '70's and long prior to any irrigation interests there.

4624 The question of the construction of dams along these rivers was not considered to any considerable extent when we passed the reclamation act. In my judgment, the only way that that country can be thoroughly developed is by the construction of dams on those rivers and the impounding of the immense volumes of flood waters that go down those rivers in the spring and at other times and their subsequent use on the arid and semi-arid lands. On the Missouri river I have had in mind the idea that the National Government might successfully construct a dam very much like the great Assouan dam across the Nile, and by building it up high enough, perhaps 150 feet, a vast country could be brought under ditch. My understanding is that there is a very great amount of water going down this stream in the spring of the year and at other times of high water. As respects the Missouri river, you
4625 are aware, of course that that is a navigable stream, and any proposition to take all of the waters would give rise to some question which would involve the jurisdiction of the War Department. Of course there are boats on that river up through North Dakota. We have just secured an amendment to the river and harbor bill for an appropriation of $50,000 to improve the river above the 46th parallel. I don't know how many boats there are, but quite a number. Probably five or six good vessels that are during the navigation season engaged all the time in transporting wheat and coal and other products. I should say that where
4626 navigation is the paramount interest perhaps there should be every respect paid to it, but in the case I have in mind in North Dakota the irrigation interests would be paramount. (Objection by defendants.) We get an appropriation here almost every year to improve the navigation of the Missouri river, and I have had several letters recently from Captain Baker at Bismarck, who owns a line of steamers, requesting me to get a large appropriation

to improve the navigation of the Yellowstone which has not
4627 been navigated for twenty years. Oh yes, it is a fact that the Government at the present time is making appropriations for the perfection and the perpetuation of the navigability of the Missouri river. The Government has been making appropriations for that purpose for a good many years. (Objection by defendants.) As to whether in carrying out the provisions of the reclamation act it is intended and is wise, as a matter of fact, to destroy the navigability of the Missouri river entirely through the State of North Dakota, I will say that I can only give my opinion as to that. (Objection by defendants.) I think it would be the wisest thing that I can imagine for the Government to purchase all the steamboats and prohibit the further construction of steamboats on that part of the Missouri river and devote the stream entirely to irrigation. I am not so familiar with the conditions in South Dakota, but my information is that
there are not any great number of steamboats on the Mis-
4628 souri river in South Dakota. I do not think I would destroy navigation on any stream where the interests of the community are largely dependent upon water for transportation. (Objection by defendants.) Of course there must necessarily be a difference between that portion of the country through which the Missouri river passes in North Dakota and parts of South Dakota and the country down near the mouth of the river, because the river becomes much larger and the vessels that ply the river are of greater consequence and I assume they are more numerous. I am not familiar with the number.

I do not understand that the reclamation act was passed in defiance of the rights of navigation on all these inter-state streams.
4629 (Objection by defendants.) As to whether it was the intention and whether it would be the necessary effect of carrying out the reclamation act to destroy the navigability of all inter-state streams would depend upon the character of the works that were put in. If the Government cared to go to the extent of putting in locks and dams we could have both irrigation and navigation. I suppose that would depend largely on the character of the stream, but I have no doubt it could be done. It would be a very expensive operation, undoubtedly, depending largely on the extent of the dam. In carrying out the reclamation act on the Missouri river in North and South Dakota, I suppose to construct dams on any navigable stream without locks the navigation must cease, and for that reason I stated a while ago that so far as North Dakota is concerned I think it would be a paying investment for the Government to buy up all steamboats on the river and not allow the construction of any more to ply the river, and to devote the stream entirely to irrigation, because the question of irrigation is, in that section, paramount.

Then under the reclamation act we could not retain both
4630 irrigation and navigation if dams are put across the stream. You might retain the navigation of the stream if you do not go any further than to apply gravity for irrigation purposes; but of

course when you throw a dam across the Missouri river or any other navigable stream, unless you can construct a lock in connection with it, navigation is impeded. No, the reclamation service cannot receive its highest application in North Dakota without so destroying the navigability of the streams below. Leaving out the question of navigation, the only injury that could come, in my judgment, from taking all the water in upper west North Dakota for the purpose of irrigation would be to those settlers that are located along the river on lands that would be flooded by the
4631 construction of dams. In the case of the Missouri river, so far as the cities along that stream are concerned they are on the highest land and any dam built below a city would not flood the land on which the city stands. (Objection by defendants.) Now, as to the injury of settlers below the dam, in the case of the Missouri river I doubt whether it would be possible to use all of the water that goes down that stream in any irrigation enterprise. There would also be a flow of water, necessarily, even though it were dammed. If the number of dams were increased until the water was all gone, I suppose that would be possible but it would not be probable. I suppose we could imagine a situation under which dams sufficient in extent and number might be built on any stream to divert all the water in the stream, but I say that
4632 while it is possible it is not probable. (Objection by defendants.) As to the effect of so taking all of the water upon the settlers and civilization below, I will say the settlers along the Missouri river, being largely engaged in stock raising, I do not think it would have a very bad effect. As to the effect upon the city of Bismarck, I think it would be a great benefit to the city of Bismarck, and I told them so last fall when I was up there. The construction of a large dam on the Missouri river at any point north of Bismarck for the purpose of flooding the lands on the three benches that exist there would be of vast benefit to Bismarck, and yet it would be utterly impossible, in my judgment, to use up all the water and there would be no dry bed left. There would be a stream of water flowing down there constantly. As to the effect if you should take all of the water that flows past the city of Bismarck now, I can only repeat in another way that I think even in that extreme view it would have a good effect. (Objection by defendants.)

4633 I think the same condition prevails in South Dakota. I am not familiar with the location of cities along the Missouri river in South Dakota. I have never been at the city of Pierre, and I don't know whether the construction of a dam on the Missouri river below Pierre would flood that city or not. I do know about the location of Bismarck in North Dakota, which is on the very highest land, and it would be utterly impossible to construct a dam high enough to flood Bismarck. If I may be allowed to draw a parallel, I would say that such a thing as taking all the water in the river would be decidedly injurious to a city like St. Louis (objec-

tion by defendants) or to any other city located as St. Louis is. (Objection by defendants.) The extent of the injury would depend upon the size of the place. I am not familiar with the location of either Kansas City or Omaha. I don't know how high above the water they are located. I have had in mind chiefly now the situation as to Bismarck, the capital of our State, which is on the very highest land and could not be affected.

As to the effect upon the lands in South Dakota if the State of Montana just across the line between North Dakota and Montana should take all of the water of the Missouri and Yellowstone rivers and apply it to irrigation at any place within the State of Montana, I think the question answers itself. (Objection by defendants.) If they took all of the water we would not have any left. Where you take all of a thing there is nothing left. As to the effect if the
4636 State of Montana should claim the right by virtue of her State sovereignty, her constitution and laws to control all of the waters of the Missouri and Yellowstone rivers and should apply all of those waters to irrigation within her borders, I make the same answer that I made before—that if they took all the waters we would not have any water except that which might arise in our own State. (Objection by defendants.) As to the aim and intent and purpose of the committee that framed and passed the reclamation act, I will say the aim and purpose of those who framed the irrigation act was to secure the use of all the water possible in the arid and semi-arid region for irrigation purposes, regardless of State lines, if it could be done, of course, within the law and without violating the con-
4637 stitutions of the several States. (Objection by defendants.) Our view was that most of this irrigation would be carried on in the beginning on the public domain, and there were members, and good lawyers too, on the committee who held that the Government had the right to the exclusive use of all waters passing through the public domain. There were others, of course, who held to the theory that the right of the State was superior; and I do not think we reached a conclusion on that question. I do not think we got very far along that time, which of course you understand is always a great question. Our committee was not called upon to pass upon the legality of the act. As to whether in framing the reclamation act it was to be carried out without the consideration of interference by State lines, I will say it was the general opinion of those who dealt with the subject that that was a question which must necessarily await future adjudication as the cases arose. (Objection by defendants.) As to the right under the doctrine of State sovereignty and its constitution and laws for the upper State to take all of the water of an inter-state stream that rises within its borders, and as to whether or not that would necessarily restrict the application of the reclamation act to the upper State as to such waters, I will say that that was a question of opinion largely. We did not pass directly on that, of course. In passing any new legislation legislators are

necessarily obliged to feel their way and to leave any dis-
4638 puted points to the courts. Of course it was not the expectation or purpose of those who handled this question that there would be any destruction of any property rights. (Objection by defendants.) It was not the purpose, and generally speaking, it is never the purpose of those who legislate to destroy property or rights or injure individuals. As to there being prior vested rights on the lower portion of an inter-state stream to which the reclamation act can apply, I will answer that I could not say as to every case but I assume that, generally speaking, that is true. In our own State of course there would be a few prior vested rights. And it was not intended to do any injury to anybody or any property anywhere. (Objection by defendants.)

Cross-examination on behalf of defendants.

By Mr. DAWSON:

4639 I consider the advantages of irrigating the adjacent territory as much greater than the disadvantage of lessening the flow of the river past Bismarck. Decidedly so. There is a
4640 large area of country in the vicinity of Bismarck which could be made valuable and could be farmed profitably if it could be brought under irrigation that is now producing a great deal, and that is true on both sides of the Missouri river. In my judgment the navigation at that or any other point in North Dakota on that stream would be of very small consequence in comparison with the advantages of irrigation. Of course any vessels that were plying on the river would be limited when they came to the dam. They could not go above it without locks were constructed, which is an expensive business. This damming the river at a certain point would not necessarily destroy navigation on the lower regions of the river, neither would it destroy navigation on the upper regions above the dam, because the fall of the Missouri river I think is about a foot and a half to the mile in that section, so that a
4641 dam of 150 feet in height would set the water back a great distance up the river and would make splendid navigation above the dam. It would simply prevent, in the absence of locks, the boats from the lower side going up or the upper side going down. It would be overcome, though, by the building of additional boats, perhaps, above. I cannot conceive of a condition under which all of the water that passes down the Missouri year in and year out could be used by irrigation; and as to the practical question of danger to be found in the mere subtraction of the water necessary for irrigation from the river, I should say it would be very small. We have not had much irrigation up to this time in North Dakota. We have no irrigation under the National Government at all. Their irrigation there is in small projects by private enterprise, and
4442 they have been established within the last three to five years. I have not much personal knowledge of irrigation and its

advantages from direct observation. Some years ago when I lived in California I studied the question to some extent, but the conditions there are very much different from the conditions prevailing in North Dakota.

In regard to seepage or return waters from irrigation, I know that only by a study of the question from what might be termed text books, but I believe it to be true that eventually you do not need anywhere near as much water as you do at the beginning. During the year there is a great variation of the flow of the water in the Yellowstone. In the spring time we have not only high water but often dangerously high water, and later in the season we have a flow of water which varies and is indeed small as compared with
what we have earlier in the season. Of course it runs very
4643 low sometimes in the early summer. And then we have
floods in the fall too. From my observation and also from my reading I think it would be true that the damming or reservoiring of the Missouri river and the application of its waters to irrigation at times when there is a large supply of water would tend to equalize the flow of the stream by reducing the maximum flow and increasing the minimum flow later in the year by return and other waters, because the purpose in damming a stream is to take the water out into reservoirs—to take the flood waters out into reservoirs so that the excess waters which cause the stream to be swollen at times would be diverted and taken off into reservoirs for use in irrigation.

4644 W. A. REEDER, Washington, D. C.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I reside in Logan, Phillips county, Kansas. I am a member of Congress from the 6th congressional district of Kansas. I have been six years a member. I am now a member of the Committee on
Irrigation of Arid Lands of the House of Representatives. I
4645 have been a member of that committee for six years. I know the
act commonly called the reclamation act of 1902. I was one of the committee of seventeen that formulated that act. I represented Kansas on the committee. Yes, I paid more or less attention to irrigation as being one of the matters of some importance to the district in Kansas which I represent. I have watered four hundred acres for several years in Kansas, the largest irrigation farm in that State.

I have never lived along the Arkansas river. I have known it
and have been along the river several times, but I live in the
4646 northern tier of counties.

I think I know something about return or seepage waters. The stream I irrigated from was improved at the low season without

any question by irrigation above. We had occasion to observe that matter very closely, because we had a law suit for the use of the water and I took a great deal of pains to measure the river several times. This is the Solomon river. I was irrigating from it. We would measure the water just above the backwater dam, then we would measure it three miles or about three miles above that, then we would go below the dam four and a quarter miles and measure it again. That was at the edge of the farm; the farm was four and a quarter miles long. We watered on both sides of the river. Then we would measure it three miles below that again. We always measured in low water. We found there was no perceptible difference in the two upper measurements. There was no perceptible difference in the two lower measurements, but the lower measurements always showed practically twice as much water as the
4647 upper ones. They were made in 1894 or 1895, the third or fourth year after we had been irrigating.

I was the irrigator that had the law suit with a power plant in Kansas. They undertook to enjoin me from taking the water. I showed it to my own satisfaction, that by irrigation we did not interfere with the power plant, but they enjoined me from using the water all right, declared our law unconstitutional and stopped us from using the water. I showed that in dry weather they had twice as much water as they ever had. I did not convince the jury of that, though.

There is an underflow in the Arkansas valley in Kansas, and the upper surface of that underflow would retain all the water put in there in addition to what is there naturally, and it seems to me it must raise that underflow. That is, any water put in the soil above.
4648 It would not raise the underflow in Kansas, probably, for a number of years because it would certainly take a number of years for that underflow to pass from where it is being used to Kansas, but in time it certainly would.

I have made a study of irrigation for twenty-five years. I should say it was very clearly to the best advantage to use the water just as near the source as possible. If you use the water intelligently near the source of a stream I think it will equalize the flow of the
4649 stream in dry weather. I am satisfied it will. If the soil is filled with water, regardless of what the source is, when dry weather comes it certainly will flow back into the stream. If water were taken out during this dry season and there was considerable water in the stream, then there might be less water below than above, but we could not do that in our stream. We could take out every drop of the water we could and then there would be more below than above. There is no question in my mind but what the stream will flow more regularly from wet land than from dry land.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

I have lived on the Solomon river for thirty-three years constantly. I came to Kansas in 1871 and have lived in that valley ever since.

The Solomon valley will run from two or three to ten miles
4650 wide. The part we are irrigating in I suppose would not be over two miles wide. That was in Phillips county, above the town of Logan, where we were irrigating. The crops on the valley lands are better on an average now than they were in the early times. I don't think irrigation has had anything to do with that. I think the crops are a good deal better all through that section of the valley on the average than in the early days, though we occasionally had pretty good corn and sometimes pretty good wheat. But it has certainly very much improved. The average corn crop in the Solomon valley, then, in the thirty-one years I have lived there, has increased instead of decreased; that is, in Phillips
4651 county. There have been some uplands brought under irrigation and cultivated in corn since I came there, and my judgment is that the upland crops have improved more than the valley crops. (Objection by intervenor.) I think the uplands raise as much corn as our bottom lands. I have not thought about that particularly, but I expect it would be hardly safe to say that they do raise as much. That would depend much on the character of the land. If the uplands were nice, flat, level land I would not be surprised if the average were just as good as the bottom land, but taking into account the rolling land, I expect it would not average as good. I lived in Mitchell county the first nine years after I came to Kansas, and have lived about twenty-nine years in Phil-
4652 lips county. I expect that in the earlier years the creek and river bottoms were farmed more than the uplands. (Objection by defendants.) For the first two or three or five years after the bottom lands were settled, certainly a large per cent. only of the bottom lands were in corn; yet people certainly settled there very early on the high prairies. They farmed these prairies in 1872. Yes, it is true that the bottom lands were settled first, and the average yields that were reported were more largely from the bottom lands than from the uplands. I think from 1890 we certainly
4653 have raised the best corn on the uplands. (Objection by defendants.) Upon further reflection, I know that the uplands on my farm produced the best corn. Now, I know about that farm because the low lands are rather sandy, and while we sometimes get pretty good corn on the low land, when we had a good corn crop we got it on the upland. The river bottoms are not as good
4654 soil as the creek bottoms. They are not as heavy a soil. And I presume in the early days the creek bottoms were farmed fully as much as the river bottoms. And I expect if you would make comparison between the creek bottoms and the upland it would be more in favor of the bottoms than if you made a com-

parison between the river bottoms, which are sandy and not
4655 so heavy a soil, and the uplands. We are doing better farming now than we did in the early years. My impression
4656 would be that the average of crops is certainly better now than then. I was the defendant in the law suit I have men-
4657 tioned, and some nineteen or twenty of the Solomon Valley millers were the plaintiffs. They brought suit to enjoin me from using the water for irrigation. I attempted or sought to prove that there was as much water in the river after irrigation as there was before in dry weather, but the jury found otherwise and judgment was rendered against me upon that verdict. That was in the Solomon valley. There are two things that I am very clear on: One is that all of the streams in our section run a great deal less water than they did earlier. That is one thing. It didn't make any difference about the irrigation. The next is that my experience and my judgment are that if you will make the soil thoroughly wet by irrigation at the head of a stream it is bound to be a more
4658 regular stream. Our creeks now run water say three to six weeks a year that used to run water eight or nine months a year. There has been no irrigation there. My judgment would be that there is no perceptible difference in the amount of rainfall but a great difference in the character of the rainfall.

I think there is an underflow in the Solomon valley, but I don't know anything about any current. I know if you will go down a short distance you will find water, but whether it is moving or not, I don't know anything about that. On the farm I was irri-
4659 gating you would strike water in about eight or ten feet on the bottom lands. I don't know whether that would be an average depth in the valley, as I have had no experience excepting on that farm. You might have to go deeper farther down the valley.

In the Arkansas valley, if from Pueblo to Lamar during the irrigating season of the year they took the water out over and over again with ditches so located that each one, because of its needs, took all of the water, both the regular flow and the seepage, my judgment is that it would flow less water for the present below.
4660 I think there is no question but that it is true that the Arkansas river during the last ten or twelve years has flowed less water, very materially, through the State of Kansas than it did formerly. I only know what I saw in person in regard to that. I know every stream in our section has done the same thing without irrigation. I always thought about that, wondering if the fact is that the lowering of that river was not due to the same cause that lowered all the streams in our section.

The real source of the Solomon river is springs in the western part of the State. I do not know where the springs come from, but it would be some distance from any visible supply, because it cer-

tainly must be some sixty or seventy miles down in the State
4661 before the first water appears. I don't know where the Smoky Hill rises. The Solomon river rises in Kansas. I know where what is called the Central Solomon rises. It rises in one stream within about twenty miles of our town. I am not able to say whether that stream has decreased in the amount of its flow to any extent for the last few years. My judgment is that it has not. If they continue in eastern Colorado to take all of the water from the Arkansas river and each successive ditch to take all of the seepage water as well, allowing only such excessive floods to escape as they cannot control, my judgment is that in time the river would be larger in Kansas, all of it. If each successive ditch coming down the river takes all of the seepage water, it might be some time before it would ever get down into Kansas, but it
4662 certainly would be greater in time, for this reason. The river will simply receive more water out of a wet soil than a dry one, and if you continue to make wet soil by irrigation it certainly will run more water in time. If the evidence shows that all of the seepage water in Colorado comes back into the river above the mouth of ditches below and then is taken and successively taken, as to how any of that will get down in Kansas, I will say that every time the water becomes seepage and is carried out into another ditch, that seepage is carried still farther down the river and extends the seepage towards the east that far. (Objection by defendants.) That is why I think it is advisable to take every stream out, barring prior rights of course, as near the source as possible, because it must carry seepage that finally makes the river stronger and when you use the water once that is all you can do with it until it soaks back. If you use it near the source you can use it again, and it seems to me it will finally give the very best possible use of the water and the best possible stream. That
4663 is, assuming there is no evaporation nor any going into plant life, but if there is any evaporation that evaporation is an advantage to the country. If the testimony shows that the seepage by reason of arroyos, ditches, rivers, etc. in the State of Colorado all comes back into the river above the mouth of the lower ditches and is successively taken during the dry season and applied to the land, that again the seepage from it comes back into the river above the mouth of lower ditches, as to whether the only seepage water Kansas ever would get would be from the lower ditch, I will answer that I would doubt that evidence. (Objection by defendants.) Upon that theory, however, I would say that that would be true, but I would add that I do not believe the theory is true.

4664 I said in my examination that I thought that water should be taken out for irrigation as near the source of the stream as possible. Now, as to whether that gave Colorado the right to take the water in the Arkansas river within the limits of Colorado if Kansas prior to that time had appropriated that water lower down the stream, I will say I suppose legal prior rights would have to be

respected (objection by defendants); but to make the very best possible use of the water for irrigation I think the water should be used as near the source as possible, and I want to give two reasons for that: First, it avoids a waste of water in transmitting it to the place of usage; in the next place all of the advantages of evaporation and seepage will accrue to the lower lands. As to whether the water shall be taken out near the source of the stream and should be so applied subsequently to its prior appropriation by prior irrigators below on the stream, to their ruin, I would say that I do not think there is any question but that legally those rights ought to be taken care of, but I am speaking of the very best use of the water, not considering those rights. But I suppose in reason they ought to be cared for.

4665 In framing and passing the reclamation act I will say that it has been the purpose to protect the prior use of water first used by parties lower down on the stream, and we regarded that as just between men and men. (Objection by defendants.) It was not the intention of the framers of that act to allow parties above on the stream to subsequently take the water above for irrigation purposes to the detriment and destruction of property below.

Cross-examination on behalf of defendants.

By Mr. DAWSON:

4666 We put in this irrigation plant in 1890 on the Solomon river. I don't know how long since irrigation was first practiced on that river. There were, I think, some small plants there, but they only irrigated a few acres in a place. Since I was enjoined from carrying on that irrigation there has been no considerable irrigating done on the Solomon. The flow of the Solomon river as well as the creeks in my part of Kansas is very much less than in the early days, and that is entirely independent of the use of the waters from these creeks or the rivers for irrigation. Rains in the early days came more in

4667 the form of cloudbursts. It seldom occurred in the early days that rain fell from clouds moving to the east or west. They would generally bank up against the mountains and then it would gather and there would come a very heavy precipitation. Now, most of our rains, I am safe in saying, fall in clouds passing east and west. A farmer living on the right bank of a stream called my attention to the fact that after a considerable drouth the water commenced to run and continued to run for, I will say, thirty hours, and quit running. The weather was still dry and there was no sign of rain for twenty-four to thirty-six hours, and after rain commenced to fall and fell continuously for over three days and about four to four and a half inches of water fell the creek did not rise. No water flowed in the creek after that rain. This is one of the peculiarities of the small creeks in my locality that I have spoken of. The break-

ing up of the soil and cropping it means a less run-off to the
4668 streams than when the land was in the original sod. After the rain occurred, the sudden, dashing rain when the grass was short or burned off, for a time the stream would carry an immense amount of water, but I don't see why it would not dry up quicker than now. It used to run eight or nine months in the year, and now only six weeks. I am not accounting for that, because I don't know how to account for it, but that is the fact. It is a fact that there is a greater run-off from sod ground than from plowed ground. There is no question about that in my mind. In irrigating on the Solomon river we took nine-tenths of the water that we put on the ground at a time when the water was flush, and I always thought that the return waters from the irrigated lands made their appearance in the stream below some considerable time after that was applied to the land. If the creek was carrying water three feet deep water certainly could not seep in over that three feet, but if it would fall six inches that would seep in, and then fall another six inches and that six inches would gradually sink in, so
4669 that the water would sink in as the creek became lower. It is a fact that if the water is put on the soil and sinks in its progress in returning through the soil is much slower than its flow over the surface, and there is no question but that taking the water out during the flush flow of the creek causes it to return to the stream at a time when the normal flow would be low, and thereby it equalizes and maintains the flow of the stream. I don't think there is any question about that. By taking the water out when the stream is flush you reduce the maximum flow, and later on increase what would be the natural minimum. Let me give you an illustration that I gave one of the millers who were conducting this suit: We put, out of freshets, when they couldn't use the water, say two feet of water over six hundred acres, and when the water was cut down so that they began to need it we put that water back in the stream, and covered it up so as to prevent evaporation by putting it down in the soil. That caught that fellow, too, and if he could have gotten out of the suit he would have quit it. I think the fact of
4670 the matter is that the irrigation of lands in itself is an excellent method of reservoiring water. I think the construction of reservoirs near the headwaters of streams and the irrigation of lands in their vicinity will both add to the permanency of the stream farther down during the dry period of the year. By irrigating near the head of the stream it saves loss in acreage by evaporation and other methods, and second, it gives a better opportunity to use over and over again the return or seepage waters.

Speaking of crop conditions in my county, it is true that the earlier settlers had the first choice of lands and the better lands in the majority of cases were first taken. (Objection by complainant.) And I should think that that fact in part accounts for the better average crops in the early years if it be true that there was a better average.

4671 Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

I think the bottom lands, however, yield as much or more now than they did during the earlier years. I don't see any reason why they should not produce a little more, even, now, because we are farming better. Each particular acre since it has been broken up might perhaps yield more, but the average, because the first lands were richer than the lands that were subsequently cultivated, would bring down the general average.

Recross-examination on behalf of defendants.

By Mr. DAWSON:

4672 During the first year of our irrigation there was no apparent seepage or return waters from the land. During the second year we had some streams breaking out in the banks of the river. During the third year those springs became larger 4673 and more numerous; and after we were enjoined and ceased irrigating the land those springs ceased to exist.

4674 Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

Yes sir, the jury found against me, contrary to my evidence, upon the questions of fact, and the court rendered a judgment against me on the ground that we were injuring the water power of the plants at that time. There is no question but that is what they found.

4675 WILLARD D. JOHNSON, Washington, D. C.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I reside in Washington, D. C., and am connected with the Geological Survey of the United States. I have been so connected 4676 since 1879, with two interruptions, amounting in all to about a year and a half. I was for a good many years topographer, that is, map maker, and then hydrographer in Mr. Newell's hydrographic branch of the Geological Survey. I have had experience in the field since I have been connected with Mr. Newell's bureau, in work of the same nature as Mr. Newell's, quite a number of years, with Mr. Newell, since the early summer of 1896, and then for about two and a half years following.

I have made some study of what is known as sheet or underground waters in the plains regions of the United States in connection with my position for a number of years. Previous to the time I began definitely on hydrographic work with Mr. Newell I was much in-

terested in underground water problems in Nevada, and then
4677 on the desert plains of Mexico from Sierra Madre westward to the gulf of California. With Mr. Newell I was a student of underground water problems for two and a half years. I made a written report of my views with respect to sheet or underground waters. It is found in the 21st Annual Report of the Survey and is entitled "The high plains and their utilization," and this was embodied in the 21st Annual of the Survey, part IV. That report deals with the subject of sheet waters in the Great Plains region.

Speaking generally of the water of the Great Plains it confines the discussion to the belt north and south along the Great Plains
4678 slope midway between the foot of the mountains and the prairies to the east. In that report I reported there on rather detailed studies from the latitude of the northern boundary of Kansas southward to the souther- boundary of the Staked Plains of Texas, which includes the valley of the Arkansas from a little west of the Colorado-Kansas boundary line into central Kansas. My deductions with respect to the extent of that sheet water are that the ground everywhere has ground water, the world around. In the Great Plains region the condition is somewhat peculiar in that there are no mountains or rocks sticking out from the surface, but the whole thing is burried under a great sheet of gravel and sand, which, together with the clay, covers the Great Plains rough rock surface and is saturated with ground water up to some level, varying in depth below the surface, which is called the ground
4679 water surface or the water table. It is a universal plane. And this ground or sheet water extends under the surface of the plains everywhere, and coincides with the surface of the plains where valleys have been cut down through the surface until they meet this ground water plane. There is no particular difference whatever between the sheet or underground waters in the Arkansas valley and the sheet or underground waters of the other plains sections. (Objection by complainant.) That is, no difference in character. Yes, in this investigation I made a study with respect to the source of supply of these sheet or underground waters. That was the principal subject of my investigation in that region. From the investigations I have made with respect to this matter I would say that the origin of underground waters everywhere is rain-
4680 fall. The ground water moves from one region to another, and while it may be rainfall in one region it may be rainfall transported in another region, but in the region of the high plains, although the origin of the ground water is in very small part from the mountains, it is, in insignificant part, from the mountains, and almost wholly from the local rainfall. In Colorado and Kansas the investigation I have just spoken of was confined to the Arkansas valley mainly in Kansas west of Dodge City, running over a little into Colorado; but I had previously given very much and very detailed study to the Colorado Arkansas valley clear up to the head-

waters, having surveyed the whole drainage basin of the Arkansas river.

I stated that the Great Plains as a rule were deeply buried under loose material—sands, gravel and clays. That is true of the whole; it is not true of a portion of the Arkansas valley—that portion of the Great Plains that is drained by the Arkansas river

4681 in Colorado. In Colorado the sheet was somewhat thinner originally but has been worn away almost wholly so that it has left exposed the rough bed rock underneath, and old patches of that rough sheet or covering of gravel remain yet. But where the hard rock surface is exposed the ground water hardly exists. It exists in little channels of gravel. When we get farther eastward, near the Arkansas line, there the sheet becomes thick again, that is, it has not been eroded away, and there there is a universal sheet of ground water. The portion that I studied most in detail, including the Arkansas valley southward and northward, is totally burried under gravel, sands and clays, and there the ground water has corresponding depth. Its surface parallels the land surface pretty nearly. I made an examination of the ground water by sinking wells to determine its level and its slope, except where wells already existed which would serve the same purpose, and I found that the ground water surface rudely paralleled the ground surface,

4682 but was not quite so irregular. It was a great sheet, I should say, roughly parallel with the surface, excepting where the surface was sharply cut to a considerable depth by streams, making valleys running east and west across the plains. There the ground water surface dipped toward the stream valley bottoms and coincided with the stream valley bottoms where the stream valleys were deep. There are some small, shallow valleys on the plains which have not come down to the ground water. Those valleys going down to the ground water have in some cases perennial streams and in some cases not. The Arkansas river is in Colorado and well out toward Kansas, but not reaching to Kansas, a perennial stream, falling short of the Kansas line, where it is normally an intermittent or dry stream, with a flow occasionally in floods. The Arkansas valley, however, coincides with the ground water surface along its course from a little back in Colorado well into Kansas. In central Kansas or in the neighborhood of Dodge City the ground water supplies that normally dry stream and makes a new stream, starting from the ground water and flowing eastward; so that the

4683 Arkansas river is really two streams. It is a stream drained from the surface waters of the mountains in Colorado, running eastward, draining out of the mountains and carrying its run-off until that run-off contributes to the sand on either side and evaporates. It largely evaporates. And then in Kansas quite a ways eastward, after a long break or intermittent stream or dry stream—normally dry stream valley—the river begins again by inflow from the water shed dipping to the valley from either side and flowing in in excess of the loss by evaporation so that it makes a

visible stream again. I should say I sank a hundred wells—two or three of them in the stream. It was necessary to go but a few feet to find water in the dry season. In the wet season the water was above the surface. I had many wells on either side. I extended a line of wells for the purpose of determining the slope of the ground water surface from the Arkansas
4684 River bed, beginning in the bed northward, right through the city of Garden City, and on the second and third benches and finally onto the uplands, excepting where I would find a well along that line or close to it, an old well, which would serve my purpose, and would bring that into the system. And then I would sound those wells, keeping up a series of soundings for two years afterwards at intervals of a week and shorter intervals for a shorter time. I had a line of wells running north from the river for six miles, and then at right angles with that line of wells and parallel to the course of the river but pretty well up above its bed I had a line of wells for several miles at short distances apart—two or three miles. So I had a line north and south, from the river northward five or six miles, and another at right angles with that for three or four miles. At what distances I do not remember, but in the five or six mile line of wells I had say twenty odd wells. In the bed of the stream at that time you could hit the ground water plane with your toe by scratching the gravel; but on a ten foot bank you would have to go ten feet minus a little. The ground water plane sloped toward the river. The ground water was feeding into the river bed. The river bed served—because it fed so slowly—as an evaporating pan for evaporating what was con-
4685 tributed from the slopes. As we worked backward from the river the water plane got deeper and deeper out on the uplands until it was forty-five feet deep, I should say, from the ground surface, on the uplands, down to the water plane. Back toward the river it was less in depth. It was rising at such a height that the deepening of the ground water was at a less rate, and as I got onto the uplands the water plane there was many feet above the river. I couldn't say how many. I was surveying the water plane. It rose away from the river, northward, at a rate that gave a slope of ten feet to the mile, something like that. The wells did not indicate that there was a current to this sheet or underground water. I afterwards determined the fact of movement, not its rate. There is a very slow movement, and it will have to be investigated
4686 for a very long time before it is actually determined. I determined the general fact that the water plane sloped and that the ground water body moved. From my investigations and study of this question I would say that the source of the supply of this sheet or underground water in the valley of the Arkansas river is from the ground water on either side drawing in toward the river on that slope. Absolutely none of it comes from the flow in the river itself. It is impossible. But I should qualify that statement. I was speaking in a broad, general way. There is a little narrow,

insignificant belt close to the river that would back up a little water. When we speak of the stream we are speaking, in Kansas, of the Arkansas river in Kansas. We are speaking of a dry stream bed as rule, so that there is really no stream, and we call it an intermit-
tent stream, meaning a stream bed along which water flows
4687 sometimes and at other times it does not. But speaking generally of the river, I should make the general statement that the normal river that runs continuously runs from three sources of supply—one, the precipitation that falls directly on its surface, another that falls on the surface and runs into it without going into the ground—an insignificant amount falls upon the surface—and another amount, varying, which falls upon the slopes tributary to it and runs off into it. The third source of supply, the normal, steady, persistent source, is from the ground water. I use the term "intermittent stream" to make the distinction between that and a perennial stream—a stream with a constant flow. The Arkansas river from a little back in Colorado well into Kansas in the neighborhood of Dodge City is an intermittent stream; that is, it is normally dry.

I made observations in respect to whether or not the water in the wells that I had dug would rise and fall with the rise and fall of the stream itself in the bed of the river. The line of wells run-
ning away from the river up the slope of the valley reached
4688 the ground water at an increasing depth, but that depth increased so much less than the rise increased that the ground water plane was an ascending one back from the river. After going a few feet above the river the rise in the river had no influence on the wells, because the wells' surface was above the river. Where the wells' surfaces were notably above the river, several feet above, they were not affected by fluctuations in the rise and fall of the stream. That is, it would influence a well a few feet away an inch or so, but several yards away it would not influence it. The distance varies. At a distance of two or three hundred yards back from the river there was a slight effect felt in these streams which I had gauged continually day after day for a long period—a slight effect experienced from floods in the river. That is, the river would be deepened to two or three feet during flood. The river is quite broad. And that two or three feet will be felt back as two or three feet extended to the distance of this rising slope, in the wells, and that was two or three hundred yards back
from the river, perhaps, and the wells would be raised to
4689 that raised level, or two or three feet. But as they were already higher than the river it would not be raised so much as two or three feet in the wells themselves, but back of that two or three hundred yards for the rest of this five or six miles of course the rise and fall of the river had no effect whatever. The ground water still contributed to the river on these broad slopes. I explain the coincidence of the rise and fall of the water in the wells close to the river with the rise and fall of the river in this way: It is of two kinds. I

should not say that the river water came into the wells but that the water running down grade to the river was backed up against the river water. The river bed, probably, across its cross-section, was still receiving contribution upward from the ground water, even in flood; but where the river manifestly overflows its banks and overflows dry ground, it will lower into the ground and contribute to the upper surface of the ground water there; but that can be only a little narrow belt.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4690 There are two parts to the article that I prepared on "The high plains and their utilization." The second part is in the following annual report. I did not intend to-day in my testimony to depart from any of those principles that I laid down in that article. I have, however, spoken of some other matters that I have not spoken of in the article. I intended to say substantially
4691 what I said before. If there are any apparent conflicts it is only apparent. The conflict is only apparent on either side; that is, I may re-state what I put in that report to bring it into agreement with certain general principles which I have just tried to explain.

It is a little difficult for me to be accurate as to how long I was in the Arkansas valley between the Colorado line and Dodge City making these experiments and examinations. I was there twice. I was there for one summer, I think that was the summer of 1896, and then the next summer I began my field work there, spending, I should say, two or three weeks and extending that field work southward, applying general principles which I had applied in the Arkansas through a broad region southward to the end of the Staked Plains. The first summer I was there I was there a number of months. It may have been four or five months, something
4692 like that. I think I made a little trip once up to Goodland, which is north of the Arkansas valley, on the high plains, testing wells up there. I went up to secure well tests farther up into Colorado up the Arkansas valley. I made a little excursion up to Rocky Ford, Cañon City and Pueblo. I was not in the Arkansas valley the whole of the four or five months. I spent my "field season" there, as we speak in the Survey. I devoted my field season to the Garden City region, with the outlying regions, to which I gave a small percentage of that time. The next summer, 1897, I began my field work there, outfitting, at Garden City, and I suppose I spent a couple of weeks in the Arkansas valley, with half of that time devoted to observation and the rest of it to outfitting. I have not been
4693 there at all again excepting once or twice. Once I stopped over in Garden City to see some friends, but was not there to make any measurements. Yes, I should say I have been all to-

gether in the Arkansas valley in Kansas for four months about Garden City, but for a much longer period in the Arkansas valley in Colorado. My observations in the Arkansas valley extended from the headwaters of the Arkansas river in Colorado to Dodge City. I dug no wells down as far as Dodge City, but I examined some. The wells I dug were immediately about Garden City, not outside of the city limits of Garden City east and west, but
4694 northward up onto the high plains and southward for a long distance. All the wells I dug in the Arkansas valley are confined to a cross section across the Arkansas river at Garden City. I then ran another line of wells at right angles to the first line up and down the valley, central at Garden City, for say four miles. All of these wells were dug in a belt four miles wide east and west and some six or eight miles north and south.

As to my examination of wells below Dodge City, well, I did examine a little. I made a little reconnois-ance trip by rail, I have forgotten how far, but I think I went to Hutchinson, Kansas, examining wells of water supply plants, etc., merely to get at
4695 the level of the ground water. I made a trip down the valley sometimes by rail and sometimes by hiring a livery team, alone, merely visiting wells, sometimes private wells and sometimes water supply plants, to get a general knowledge of the depth of the ground water. This was in 1896. I made an examination about that year. I am speaking from memory. Well, it was that same season and it was a part of that four months that I speak
4696 of. There were all together, we will say, a couple of dozen wells that I had carefully sounded every Sunday by the most reliable man I could get in Garden City to attend to it, for say two years, once a week. This was during the years 1896 and 1897. The ground water varies over the city of Garden City according to the level of the terrace on which the city lies. There are two or three terraces there. I am speaking from memory. There are several, but the city people speak of two, because there are two main ones and some little steps in between. I think the people locally call them first and second terraces or first and second benches. I have forgotten whether they call it the first or second bench that the city is chiefly on. The main body of the city, where my line of wells was, was one-quarter of a mile back from the river and there, in round numbers, the wells were from ten to twelve or fifteen feet to ground water, depending on the slight un-
4697 dulations of the surface, to which the ground water level did not seem to correspond. The depth of the wells near the river depends on the depth of the ground water. It runs from ten to fifteen feet on the broad terraces to a less depth near the river. These experiments were based on the conditions that I found there in 1896, I will say.

4698 Q. You have no means of comparing that with the condition of that ground water fifteen or twenty years before that, have you?

A. Of course it would be part of a very interesting matter, what had happened previously, and the only way in which I could inform myself was by asking questions, and I devoted a good deal of time to questioning everybody who seemed to be reliable, getting data as to the ground water back as far as well history went in that region, and all the old settlers, all the well makers that I questioned in that neighborhood to determine the depth to ground water, gave the depth of the wells to compare with my present depth, and as to how reliable that testimony is everybody can judge for himself, but probably nobody has gotten so much testimony as I got at that time as to variations in the depth of the ground water at Garden City as far back as Garden City history extended.

Q. Did it vary?

A. Oh, it varied, yes sir. It varied very greatly.

Q. How much?

A. Well, let me see. Where the depth to ground water was twelve feet, we will say, it had lowered from four feet, and previous to that it had been about what it is now. That needs an explanation, a very important explanation, that ought not to be omitted, if you wish me to make it.

There is an artifical cause, a ditch system taken out above Garden City for the watering of Garden City, just a little east of the Colorado boundary line, distributing water above the city during the growing season, and that water soaking into the ground raised the ground water level, as water always does from ditches, so the ground water level through a series of years gradually rose until it stood—well, four feet perhaps would be rather high—but in some places it was up as high as four feet. The local users of that water would turn water over an alfalfa field and let it flood that field for some time, and the result was that the ground water plane was gradually built up until it was several feet higher than it was before. The next year if they didn't water it would drain down again. During the
period when Garden City was watered from ditches, there-
4699 fore, the ground water level was much higher than before.
That ditch period went back to about 1888 or somewhere in that neighborhood. The ditches that watered the city—that is, that watered the farm land near the city—and the city itself was really at that time a collection of small farms. They watered from the ditches. And the ground water rose correspondingly. Now, when more ditches in Colorado were taken out farther up, the failing river failed sooner than it failed before, and this tail-end out of which the ditches were taken was farther up the valley in Colorado, and these
ditches were now dry ditches. Garden City now exhibits the
4700 finest system of dry ditches that I have seen anywhere. As
near as I could determine, the ground water level of twelve to fifteen feet, we will say, on that broader bench, was substantially the same as it had been previous to the ditch period. I don't think I could be mistaken about that. The first settlers there dug wells, because they were expecting to get sufficient rain water to supply

them, and they didn't build ditches. The ditches came later. They dug wells for their house supply, as they did in the East. Oh, yes, they dug cellars, and I had some data on flooded cellars. They came later. The first men planted crops and waited for the rain to grow them, and I think the first season was a sort of a rainy season and they got pretty good crops. After two or three years they found they were in an arid region; but some of them stayed there. In the meantime they began to dig wells. Now, this was before the ditch period, and I was much interested in that question as to what the depth of the ground water had been in the pre-ditch period, and my impression is—I have forgotten the figures—that it was substantially the same as in 1896. Then when they found they
4701 were in an arid or sub-humid country, a country unreliable as to rainfall, with periodical fluctuations of climate, they put in ditches, and gradually the ground water rose until the cellars which had been dug in the normally dry ground period became gradually flooded by the rise of the ground water due to the flooding from the ditch water. There was an artificial condition under which the river was lifted out of its bed, you might say, and put up onto the slopes a little ways. It was lifted out by taking it up-hill where it was higher and carried around where it was nearly level, on an artificial course. Oh, that was the fact, that because of the location of those ditches there it raised the level of the ground water apparently, either in the wells or the cellars at Garden City. I was persuaded that that was the fact. I am prepared to swear that that is my firm opinion. I have no doubt about that—that the ground water was raised up into the wells and into the cellars by the flooding of the ground from the ditches. I inquired into the condition of the cellars before the ditch period in Garden
4702 City. That was my object in inquiring—to see what the condition of the ground water was previous to the ditch period. I don't know anything about what the level of the ground water is now. I have no information whatever since 1897, except by some correspondence. I don't know as I could say anything about it for the last two years. As to its condition from 1897 down
4703 to 1900, I don't remember very well. Generally speaking, there was a pre-ditch period—I have forgotten what the date was—when the ground water was low, at about where it was when I was in Garden City. During the ditch period, I was told, the ground water was several feet higher. After the ditches were dropped and not used any longer the ground water was lowered. Then I suspect that the ground water was notably lowered by the enormous increase of wells there and windmill pumping. They have lowered the ground water level. The reason is that water inflows from the surrounding regions so slowly
4704 that the rapid pumping out may locally make a depression. I do not mean to say that the whole plane was lowered by such an insignificant cause, but right around there the ground water plane,

the cone of influence, as I traced it out, was quite extended
4705 sometimes. The buildings in Garden City were not built prior to the ditch period. When I say the buildings I mean the greater number of the buildings of the town were not there prior to the ditch period. The ditches created the prosperity of Garden City, and it would be a very prosperous place if they could have continued, and that prosperity caused the building up of the town, so that the building of Garden City—of course not all of it, there were some early cabins, and perhaps quite a number of them were pre-ditch—but the building up of the town resulted
4706 from the prosperity, which in turn resulted from the ditches. The cellars of several large buildings the history of which interested me most were built previous to the flooding which resulted from the ditches—previous to the rise of the ground water—and after the building of the cellars it was found the ground water gradually rose in the cellars, and that went on as long as the ditches continued to be used, and then as the ditches failed the ground water fell. In a few cases I remember that it is true that when some of the large buildings were built in Garden City the cellars invariably went down into the ground water. Well, it is true, I know, that for the last ten years these cellars have been absolutely dry and the ground water has fallen some feet below the bottom of the cellars, and especially I remember that in one case—one large building there, it is a hotel, I think, one of the largest structures in Garden City—they put its cellar down into the ground water. They had to dig into the ground water a good ways, and when I was there the ground water was below the cellar floor. I think that was the "Buffalo Jones" building. I am not sure. At least that was a large and important building that followed
4707 late in the boom period of Garden City. Garden City was in decadence when I was there. I think that building was built in 1885. But I remember from my inquiries about that particular building that it was put down into the ground water, and they persisted in digging into the ground water, that is, that the cellar was dug into the ground water and remained with the water in it for quite a while. But there were some buildings that had been built previously the cellars of which had not gone into the water, and by the time that building was built the water was higher than it had been before. Now, I am not speaking as
4708 an expert on those facts. I still think that the level of the ground water is getting back to normal conditions. It was artificially interfered with by the ditches, but I don't think that any large cellars were dug previous to the ditch period.

If it should be true that the level of the ground water in and about Garden City for a number of miles up and down the river is now and has been for ten years last past from three to five feet lower than it was before it was affected by the Garden City ditches, that of course is not explained by any interference by man, and I do not know that any scientific man is capable of explaining it. I

attribute it to the changed climate—to the oscillation of the climate; not a permanent change of climate, but almost a secular change. I can say this much, however, positively, that it could not possibly be affected by any change in the flow of the river; that the river flowing below the ground water plane could not change the ground water plane above its level.

4709 Q. If the ground water level throughout the Arkansas valley from Syracuse down is from three to five feet lower now than it was thirty years ago, how do you account for it upon a statement of fact? (Objection by defendants.)

A. I was going to reply to that by giving the quotation that "the boy lied." It is not so. But I don't say anything about it. I would be inclined to very much doubt it, though of course locally it can be affected by local conditions.

Q. If the wells at Garden City, at Dodge City, at Kinsley, at Hutchinson, at Great Bend and at Wichita and every cellar in every one of those places where observations have been made have shown that to be a fact, what facts could you state that could account for it? (Objection by defendants.)

4710 A. Well, I don't want to answer that question. I don't know anything about it. I can only guess. Personally, I do not believe it. I would like to emphasize several words that I think I inserted there—that is *except locally*. That is very important. In a matter like this it seems to me that we exaggerate the importance of principles which may be applied to small localities in extending them over vast areas. Locally, within a town, conditions may change, as by the shifting of the bend of a river. That is a natural condition. The shifting of the meandering of a river will shift the ground water level. The general course of the river has not changed between the Colorado State line and Wichita in the last thirty years, but I said locally. Take a bend near a house or well, the shifting of the bend of the river draining down the ground water, will drain it to a different level from what it had before.

I am not a meteorologist, but I have carefully studied all the rainfall records that are official. I have given much time to it. They are exceedingly interesting in showing that while there are fluctuations there are no deviations from the mean. There are ups and downs but the average record is substantially stable. I

4711 think these records indicate periods of eleven or twelve years or something like that in the Great Plains region when the rainfall varies and the rainfalls gradually increase and then slowly decrease. They are maxima and minima. And if you draw a line there is shown to be stability of climate. One of the most fixed facts in the history of the world is the stability of its climates

4712 for very long periods. We have about forty years to go on.

Now, if we assume, for instance, that the Arkansas river at Garden City—that was part of my problem—being dry, had been made dry artificially, then it would be a question as to whether that

was a normal condition, of course, and we would have to judge from the appearances of the valley, etc., as to whether it was normally a dry stream. My impression I recorded on my map (Defendant Colorado's Exhibit 23) in that book entitled "The high plains and their utilization" by dotting the river—in 1896—from a point back a little west in Colorado to the neighborhood of Dodge City. By dotting the stream, of course, for that distance, I put on record my opinion that it was normally a dry stream for that distance, but that, normally, it was a perennial stream, that it flowed continuously,
nearly to the Kansas line, but not quite, and that it always
4713 had done so in recent geological times, and that it began again
as a new river, with a new source of supply, from the ground water, in the neighborhood of Dodge City, and continued on with an enormous increase in volume from the ground water and the run-off combined.

By referring to the river being normally dry—well, I want to get it clear that I do not mean through Kansas. I mean from a point a little back in Colorado to a point about Dodge City; and by normally dry there I mean that it flows water only in flood seasons, for
a short period during the year, and that there is no flowing
4714 water at other times. The flood season would last for a few
days all together. The river is dry and has been through all these years, so far as my observation goes, at Garden City, with the exceptions of a few days each year. "A few days" perhaps puts it a little short. It is an insignificant portion of the year.

There were five large ditches built at Garden City somewhere in the '80's.

I stated a little while ago, if you remember, that the river "tailed out" naturally somewhere in the neighborhood of the Kansas line, it is only a little west from Garden City to the Kansas line—maybe twenty miles. No, I guess it is not so much as that. Well, I don't
know how far it is really. You have got me there. I spent
4715 a long time there, but I have forgotten where the Kansas
line is. It must be less than ten miles.

The Garden City ditches get their supply of water somewhere in that neighborhood or inside of the Kansas line, but they took the water out of the stream and it ran through a portion of the growing season. It didn't run all the year round into those ditches. Of course I didn't mean that. It was partly flood water that they took. They took the ditches out of the stream just about where the stream died out as a perennial stream. The headgates of those ditches
were somewhere near the line. I don't think that they got
4716 their supply from this flowing water in the river during the
few days that it ran. I am saying that at Garden City the water ran only a few days the year round. I judge it would. Of course I am speaking of my opinion, that at Garden City the river is normally dry. That is my opinion. At Garden City a flood flow would go by only a few days in the year. It might be a month, putting it all together, but I shouldn't think it would be

so much as that. Perhaps a few days would be putting it too short. But when you get up stream you will after a while reach a point where the perennial flow of the stream stops and from there up stream you will get a larger and larger stream. I think these Garden City ditches were put in a little below that place, and that there are periods in each year—I am not sure on that point—that they didn't get any water when they were first built, and they didn't expect it, but they got a pretty good flow up there during a
4717 longer period than they could have gotten it at Garden City. I have heard of ditches all along there. They could get water only from floods. They couldn't get it in any other way. From there east below Dodge City there was a perennial stream again and ditches could get their water, but from the Colorado-Kansas line and down to Dodge City there was a distance, I don't know how far, where the river was normally dry and no ditches taken out in that space could get water only dur-
4718 ing flood runs. About 1885 there was a period when they sat and waited for the rain and it didn't come, and then they built ditches. They learned how. Then they got the river water. They were at the tail-end of a failing stream, and during flood runs they got water, and sometimes their ditch heads
4719 were washed out. The new boom and the erection of the large buildings in Garden City were the results of the digging of the ditches there. I have stated in my examination and also in my article referred to that these ditches are now a series of dry ditches, and that they went dry because the normal flow of the streams was depleted farther westward in Colorado by the taking out of larger ditches and more of them. Oh, in my opinion beyond question the Garden City ditches have been dried up by the taking out of the water for the purposes of irrigation in Colorado. The river, normally failing somewhere in that neighborhood that I have vaguely indicated, now fades, because of ditch depletion, farther back up stream, and if you take out more ditches, if you would take it all out, there would not be any river at all; it would be an artificially dried stream. But my impression was that it normally failed somewhere above Garden City. I may have made a mistake in speaking of the number of miles, but somewhere in the neighborhood of the boundary line, perhaps a little east or west of it—that is, a
4720 little above where those ditches were taken out. My impression is that they took those ditches out a little too low down. They would have gotten a more continuous run of water a little farther back.

4721 As to the source of the ground water and its having materially increased or decreased in these later years, oh, it is a matter of fluctuating climate and rainfall. If the ground water in the Arkansas valley extending back to the foothills on each side has gone down from four to six feet through that valley, I should say it was a changed climate. It is a question as to whether it has. In my examination of wells I have found that in one locality a well

would be low and in another it would be high. There are variations. And my opinion is that the people in that region are seeking facts to explain conditions and they neglect wells that have risen and cite cases of those that have gone down. I wonder if that is not so. If I were going there to see, I should want to examine all wells. I found some wells in Garden City going up and others going down. I tried to get at the explanation of those rising where others fall, and I found it was apparently due to a little over-irrigation in that neighborhood. If there was any irrigation below Dodge City it must have been comparatively little. I think if we had irrigation all over the United States it would be better for us. That is more or less a humid country below Dodge City. It would be very well to have irrigation there.

I know something about a natural lake right straight south of Garden City and a few rods west of the main street running down to the river, and upon which the bridge is located. I don't know much about it. It was right between the city and the river. There were two ponds, as I remember,—one right down on the flat river bottom itself, near a race course. That is what I call a ground water pond; that is, there is a scour hole on the upper river bed
4723 there where the river flows. In times of large floods it leaves some scour holes here and there and in the scour holes it is sufficiently deep to be deeper than the present level of the river bed, and the ground water strikes right across it. It is a perennial lake which has no visible source of supply. It has a ground water supply. I measured the fluctuations of that lake too. The water in that lake we are speaking of was slightly higher than in the Sandy River bed, but the lake was nevertheless in the flood plane of the river. That lake dates back beyond recent years; it might
4724 have been there several hundred years. If that lake has entirely sunken away within the last few years, I could account for it as a guess. I wouldn't want to publish it. I guess that the ground water plane over a very large region had sub-
4725 sided and that this subsided in correspondence with it; that it was the expression of a regional effect. If that lake between Garden City and the river was large enough thirty years ago to have fished in it and was large enough for a comfortable swimming pond for the men and was used for that, and large enough for an outlet to run across the main street, with water enough in it to have ice houses built upon it, and during the last five years that lake has entirely disappeared and the ground grassed over with the exception of one very small place not larger than this room—as to the cause of this, I would make a guess there too. (Objec-
4726 tion by defendants.) As I think about it, I would guess that the irrigation in the Arkansas valley to the westward has had a marked effect and possibly in part explains that disappearance.

As to the reservoir of the South Side ditch a few miles west of

Garden City, I investigated that matter. My explanation of
4727 that is that the ditch is simply silted up, that is, the sand has filled in from every side. That was an interesting experiment—interesting to me because I was thinking of the possibility of doing such things myself for reclamation work. I know
4728 something about the Soule ditch at Garden City in a vague way. If that ditch was built in the year 1883 and water run in it for some seventy-five miles and continued for some years, and for the last ten years has been entirely dry, I should say at once that the supply had diminished. The supply in the river has diminished, if the ditch is taken from the river; yes sir, that the supply in the river had diminished. As to the falling away of the water due to the Garden City ditches, I should say without hesitation it was due to a failure of the supply. The question might be put as to what caused the failure. I take it for granted that the taking out of the water in Colorado had something to do with it.

4729 If the Santa Fe Railroad Company has a well at Burrton some twenty miles east from Hutchinson and nine miles from the Arkansas river, and if about fifteen years ago the water got so low in that well where it had always stood in sufficient quantity before that time, so that they had to dig it deeper, and if the water rises and falls in that well according to the rise and fall of the Arkansas river nine miles away, I could not account for that from any information I have. (Objection by defendants.) If you would ask me how I account for it, I might try to. I haven't any facts.

I have never stopped at the city of Wichita, only going through there on the train.

4730 If the level of the ground water back from the Arkansas river at the city of Wichita on each side, back to the foot hills, has gone down so that to-day it is about three or four feet lower than it was thirty years ago, as to whether I could account for that, I should say that I think I could. I should not feel any hesitancy in accounting for such fluctuations in the ground water level so far eastward. By going so far eastward we would almost completely eliminate the Arkansas river of Colorado, which is one river by itself, from the Arkansas river in eastern Kansas, which has another source of supply, so that we can disregard one part, and I should answer that question by saying that the rainfall over a broad area which is tributary to that region has maintained the water plane to the level which it held some time previous. If the facts are that the rainfall during the last ten years has been fully equal to the rainfall of the ten or fifteen years in the prior period, my explanation would not necessarily fail. It is a question of the distribution of the water in the ground, and it is a very complicated matter. Any opinion I have is of very little account. I would
4731 not value it very highly myself. But it is a question that I should not value the opinion of anybody else upon, unless he had examined those conditions very elaborately, and so far as I know nobody has.

If the Arkansas river from the Colorado line for twenty miles down the river has been practically narrowed from one-third to one-half, this would be a surprising fact that I have no explana-
4732 tion of at all. If the facts in this case as testified to show that at Syracuse the river used to be 1,172 feet wide and is now 780, and the width of the river at Garden City thirty years ago was 1,181 feet wide and is now 980 feet, and I am asked to account for the narrowing of the banks, as that question is put to me it seems absurd. It is unthinkable. If by those figures is meant that the sand wash of the so-called Arkansas river at Garden City is so wide and used to be so wide, all right; but I have firmly fixed in my mind an opinion resulting from all my examinations that, as I said before, the Arkansas river was, while I was there, and is, normally, an intermittently dry stream at Garden City, and I cannot imagine that it would ever be a stream running all the year seven or eleven hundred or something feet wide, all the year round. So I would like to inquire what is meant. Between those sharp banks there are sand washes. Those sand wash rivers change their widths
4733 continually. They narrow and shift, they sub-divide and come together again. Bifurcating, it is called. If the river
4734 has narrowed from 1,524 to 550 feet at Dodge City—we are speaking about the width of the flood flow of the stream—if that is a fact—and I know nothing about it—I should explain it by saying the flood runs are less in volume than they used to be. I did make some inquiry into the question of the river narrowing at Garden City there, and I think the facts I obtained go against the statement that you made a while ago, as I remember it,
4737 that the width of the sand wash plane at Garden City was substantially the same for a long period and since then has narrowed. It may have narrowed since then, generally speaking, but it cannot be said that it was stable in width for a long period, for the facts as I got them were against that statement. It was pointed out to me that "the river used to be over here and over there at various places;" that "it was so wide at one time," that "somebody had a corral in here and that corral has all been washed away." Another man says the river on his place used to run here and now he has it included within his fence. Phenomena of that sort characterize such rivers everywhere.

4738 If in May, 1904, there were 10,000 cubic feet of water running in the Arkansas river at the Kansas-Colorado line,
4739 and if by the time that water got to Hutchinson it had decreased to a thousand cubic feet per second, as to where that water went, assuming those volumes as you state them to be correctly measured, there are two possible sources of loss—one is in the atmosphere and the other under ground. That is all I can say about it. If that flood went down at about the rate of three miles an hour and that distance is somewhere about 200 miles, taking three or four days, the amount evaporated would not be very perceptible. The loss in the atmosphere would of course be incon-

siderable. The loss of the 9,000 feet as indicated in the question went into the ground, undoubtedly. There is no other place for it to go. But I doubt very much the accuracy of the measurements. Not because it goes against any preconceived notions of mine, but because it is a question hard to settle—the accuracy of these determinations. If Mr. Newell told me that his division had gauged the river and found those facts I should consider that that was a fairly close approximation to the truth, but I should still consider it was a good deal of a guess. I do not see yet that there is any means of determining the flood flow of the river in a large flood, and where it spreads broadly the difficulty increases. I am quite
4740 sure the reclamation service would not say they could measure the flow of the Arkansas river in floods both at Garden City and away off eastward where it is sub-divided and spread. It is impossible, almost, I imagine, but I don't know. I think it is a very unsafe set of figures to go by. If seventy per cent. of the flow of the river at Lamar, Colorado, is lost to the flow of the river between there and Wichita, as to where it goes, I am not competent to answer that question. I can only go back to a certain statement of general principles, which, as I said, were important—that a normal river flowing perennially in a valley that slopes toward it is always nourished by the ground water. The ground water contributes to it. There are conditions when it is possible for it to lose, and my opinion is that the Arkansas does lose eastward in some
4741 places, but they are inconsiderable in amount. If between Coolidge, at the State line, and Garden City, seventy miles east of Coolidge, forty-one per cent of the amount of water in the river at a given time is lost, as to where it goes or what becomes of it, I will answer: Well, now, I am competent to speak, it seems to me, and I should dispute the data there. It seems to me from all I know about it that it is impossible for the river to lose anything to the ground water between the Colorado-and-Kansas line and Garden City or nearly as far east as Garden City. The river after it passes Garden City might lose, but from the neighborhood of Garden City westward clear up to the crest of the mountain divide in Col-
4742 orado the river could not lose at all. The ground water contributes to it. It was my impression that in the neighborhood of Garden City—it seemed to me that the ground water sloped a little south of east. If that is the case then the river does not lose to the ground water on that side but contributes to the ground water. I mean the river does not gain anything on the south side from the ground water, but loses to the ground water. But from somewhere in the neighborhood of Garden City, Kansas, clear westward there is no doubt in my mind the river gains from the ground water. So if there has been a loss from Coolidge to Garden City that loss must have occurred in the neighborhood of Garden City or just before reaching there, and I doubt very
4743 much that there is any such loss. If the figures of forty-one per cent. loss between Coolidge and Garden City just given

were from the testimony of Prof. Carpenter in this case, oh, it would have a great deal of weight. The doubts I had were based upon the assumption that they were guess work by residents at Garden City. If from the measurements as given by Prof. Carpenter in his testimony in this case it was shown that last May, 1904, ten thousand cubic feet of water passed the State line and had been reduced by the time it got to Hutchinson to practically a thousand cubic feet, I should answer that if those were trustworthy data, and I suppose they are, that is, if Prof. Carpenter made determinations and did not collect testimony from farmers, etc., and I suppose he did not, then I should take it that the river east of Dodge was flowing higher than the surrounding country and spread its water underground in a fan-form way. I know that on the North
4744 Platte it is something like that. If, after such floods as that, the testimony in this case of other witnesses shows that the wells on both sides of the river are affected directly by that flood or soon after it, depending on the distance from the river, as to whether the flow of the water in the stream has any effect upon those
4745 wells, I should say that I should hesitate to answer several of those questions for just that reason, that we are dealing with data that seems to me very insufficient for handling the subject, and I should imagine we might easily be misled by insufficient observation of a scientific kind, and I am inclined to think that the river loses extensively because the ground water plane descends to the right and left on either side; but I don't know much about it. I want to state, however, that I mean that my suspicion that the river loses to the right and left is confined to that section of the river somewhere from Dodge City eastward. I am still satisfied that from somewhere in the neighborhood of Garden City or Lakin westward the river gains from the ground water on either side. If that is the case, it could not, however much it might flood, lose
4746 anything to the ground water.

Q. Then if the wells at Syracuse and the cisterns at Syracuse, which is just east of the State line a few miles, follow the rise and fall of the flow of the river, unaffected by the rains, how would you account for that?

A. Well, that is a point about which I can say something, I think, to advantage. We must divide the wells into two classes—those close to the river and those distant; those in which the ground water level is about that of the wash bed of the river, just a little above, and those that are far away and much higher, where the ground water is much higher than the river bed. Now, I am speaking from my own observation here. My observation is that on the first bottom, as I call it, just above the sand, above the flood plane of the river, the ground water in the wells is so little above the sand wash that a flood in the river could affect it and cause it to rise a little. And those far away, fifty feet or more, their water level above that river is not affected at all and could not be affected except that occasional oscillations might accidentally agree with oscillations in

the flow of the river. But there could not be any causal relation. It is one of those things that is self-evident.

4747 Q. Now, if the experience of the men who have lived in that valley for thirty years and have dug those wells and kept them open and observed them from month to month and year to year back to the foot-hills or practically so shows that the water in those wells does rise after a flood, and the time being according to the distance from the river, and does fall after the river has become dry, would that fact affect your judgment in the case? (Objection by defendants.)

A. Not in the least, no sir. It would not shake it. Those observations are of no value; they are not scientific. I have tried to use them and found them of no value.

Q. If the wells along the river near Mt. Hope and Coolidge, Kansas, and back from two to three miles from the river oscillate with the river but always after the rise or the fall of the river, and the time after being determined by the distance from the river, and that observation has been made by the farmers who have dug those wells and observed it for thirty years continuously down to the present time, would that fact influence your judgment as to the cause of it at all? (Objection by defendants.)

4748 A. Such testimony would not affect the statement I have made in the least. I have used such testimony and I find it almost valueless. I have sounded wells that were said to be low and have found they were higher than they had been before, and *vice versa*. I find that the average farmer—nearly all farmers get a notion fixed in their heads and they collect those facts that support it and neglect those that do not, and I should be inclined to doubt such evidence, because where a well is far back from the river and is high above it, it is one of those things that is so obvious that I should take it for granted that the evidence is mistaken. But I want to call your attention to the fact that we are probably speaking of two classes of wells, those on the bottom land so near the river that the river may influence their depth, and another class away above. Now, a rather broad bottom land that is valuable, so valuable that we are likely to lose the notion of its comparative width, that little ribbon belt of green along the river is so valuable that we give undue weight to the evidence of wells in that belt, I think, and think it belongs to a broad area that is high above. There of course the wells may fluctuate with the river, as it is found they do.

4749 Q. In all of these questions I have put to you I have confined the location of these wells to the river bottom lands, and in no case have gone back to the uplands. Now, if these wells—and some of them down near Colwich are back from the river a few miles, and yet are so shallow that the farmers who dug those wells thirty years ago dip the water out when the river is high and when the river is low that well is dry, and that well open, and that shallow,—should oscillate with the river, but after it in each

time, would that fact affect your judgment as to that matter? (Objection by defendants.)

A. In my replies to these half dozen questions we seem to be speaking of the flood plane as at Garden City, where it is very narrow and an insignificant thing, and then away out east of Dodge City, where it is a very important thing, and the qualifications to the general statement I made a while ago that the flood plane wells do oscillate with the river applies where the flood plane is broad, and when in this last question you ask me in regard to that broad flood plane miles in width and the wells on it away east of Dodge City on those plains, if you ask me whether the rise and fall in those wells is in response to the rise and fall of the river, I say of
4750 course—I suppose,—just as I say there is no doubt it is on that little ribbon belt of flood plane at Garden City. But you see the flood plane from there widens and opens eastward until the flood plane becomes a very important thing far eastward. At Garden City it is insignificant. All that is of value in my testimony relates to the valley in the neighborhood of Garden City and westward, about Lakin, which I was calling the State boundary line, and there I was pretty sure of my facts, that the ground water slopes toward the river and that only on the little bottom land where the well water is about at the river level, only a few inches above it, can the effects of floods be felt; but when you get east of there the effects of floods are very important.

The river valley from Garden City to the State line averages from two to four miles in width, but we are speaking rather vaguely when we speak of the river bottoms, because in the first place there is a sand wash which we may call dead level. A little current or channel scratches into it and is deeper in places. Then there is another bottom land, we will say two or three feet above that,
4751 and then another eight or ten feet above that, and if that included the last I have spoken of, of the bottom land, then it is a couple of miles wide, maybe, on the average. Below Dodge City and on down below Hutchinson where the valley gets fifteen miles wide I have no doubt but that the oscillation of the river might affect the level of the water on either side in a very important way. But that is a new river out there, as I call it. That is an important part of that fact. That explains it. As to the fact about there being a current to this water beneath the ground, I speak with some confidence. That matter I have given a good deal of attention to, excepting the rate at which it moves. I don't know about that, except that it is very slow, as slow as the rate of a glacier, and we don't know how fast that moves, but they are both very slow. Now, the gravel, sand and clay of the Great Plains is deep in the portions I have been examing. About Garden City, to the north and south for some miles, it varies in depth down to two or three hundred feet. The Arkansas river valley has not cut through that to the rock bottom below the Arkansas valley bottom, and it is even deeper

above on the uplands. Of course the ground water there is
4752 very deep. Now, that mass of loose material is alternating sand, gravel and clay, and although the ground water moves through the whole of it, and moves through the clay too, it moves with very greatly differing rates through the material that is coarse and that which is fine; so that through the gravel courses or the gravel channels or the gravel streakes it moves relatively rapidly, and through the clay it hardly moves at all. Yet it does move. And an important question then is as to the relative amount of sand, gravel and clay. The clay is the greatest bulk, the sand less abundant and the gravel scarce. The gravel is arranged in streaks laid down by little streams that build the plains, and so the gravel constitutes a sort of pipes, you might say, small in amount,—of course "pipe" is a bad term to use, but gravel courses I have spoken of them as being—pipes or channels through which the water circulates more rapidly than elsewhere. Still, it is a great mass of water moving as a mass but irregularly moving, and it moves under these valleys, and it cannot be said that any one of these valleys has an underflow peculiar to itself. The whole
4753 plains have an underflow, and on the surface of the plains rivers run, and they do not always run in just the same direction the ground water moves in. The water under the river bed and back a few feet from the river bed has no swifter or slower motion than the water elsewhere, excepting as the material is coarse or fine. If the river is in flood for a long time it gives the ground water plane locally just back from it a little different slope than it had before; then if the river drops quickly that slope is steepened near where the river had been, at the river bank, and, locally, is hastened; but we are speaking of relatively minute things, and the motion of the water as a body is not affected at all by the river where the ground water slopes into the river.

As to the ground water three or four feet below the water level at the banks of the river, and for a few hundred feet back from the banks, having any perceptible current, I will state that I can
4754 speak of Garden City because I measured it there. I took the rate of motion of the ground water at the surface of the ground water, at the water plane, that is, two or three feet below, and at ten feet below and twenty-five feet below. I think those are my depths. And it all had motion eastward, a little south of east and pretty nearly across the river—but slightly across the course of the river. I had those wells there for a long time and measured about three months twice a day, and it was the same all the time.

As to the water in shallow wells on the first bottom lands always clearing from one side and that side always being directly up stream, I will say that that is a question that I went into at Garden City. The largest open well I know of is a cellar. It exposes a broad surface. It was stated there that the material cleared from one side to the other, and I used sawdust and found that it either did

not clear at all or cleared as much in one way as another. I
4755 have no doubt, however, as a result of that that there was a movement across the surface, but that movement was so slow that other causes operated simultaneously. A breath of air would clear the sawdust in one direction or another. Then I extended those experiments; I went out into the country some distance to a railroad well which was said to have cleared so rapidly from one side that the current rushed in, and I was assured that if the top should be taken off I would see the current still rushing across from the westward to the eastward side, so I paid the expense of having the cover removed and we put in sawdust there, and it stood still all over the well. Now, I was assured that that was a case in which the current rushed across the well; and so I sank wells all around that well in order to determine what the construction of the ground was, and on one side I found that a lens of gravel penetrated into this well opening a little ways. The rest of it was all clay. Now, the gravel, of course, I followed outward. The gravel, of course, let the water in rapidly. The pumps took the water out. So there was one gravelly channel cut across by the well. The dissection of the ground exposed it, cutting across it vertically, exposing one end of this long
4756 gravelly channel. It had terminated there in the clay. And by pumping the water out it was allowed to run in just like a pipe with a cork taken out of the end of it, but when the water raised afterwards and stood on a level there was no current there. The passage across the well was as slow as underground elsewhere. A foot a day or a foot a week or three feet a day. There was no doubt about the current, but it was not fast enough to show. But as to the fact as to whether the water at the level of this underground water moved, yes, it is a fact, but it is not a fact to be determined by the clearing of wells. That would be no evidence of it whatever. These things are relative. We must add some explanation if we are going to be accurate. If where wells have been dug two or three or four feet deep it was found that the water did clear from one side and gradually the clear water extended across that well, always in the same direction, as to that being any evidence of a current, I would say it would not be at Garden City any-
4757 where, but it might be and it is at Pueblo. There the grade is steep. The gravel is of a boulder formation. The ground water moves with relative rapidity. There I know wells do clear. I have examined the matter. The ground water there moves with considerable rapidity and the material is very coarse. If parties there about Garden City have observed this fact, that the open wells dug on the bottom lands do clear from the upper side and have done so from the time the valley was settled, as to whether that is evidence that there is a current to the underground water, I would say, no sir, it is not evidence. The thing does not happen.

If, at the city of Wichita, the ground water should be practically eight feet deep and a series of wells around a square were sunk and

aniline dye was introduced into one of them, in the middle,
4758 and pumps applied, and the aniline water was first observed at the southeast corner well, next observed at the southwest well and next observed very faintly at the northeast well, and was never observed at the northwest well, these wells being at the corners of a twenty-foot square and the aniline being in the center of it, I would say that that is good evidence of a current beneath the ground. The clearing should be good evidence too, but it happens that the clearing is not, for so many other little things will disturb the floating particles on the surface and make them move a little more rapidly than the ground water moves. I know that the ground water must move across a well, but I can fancy that sawdust thrown in there would drift contrary to the grade because some little influence might affect it to the contrary. In this cellar I know a door opening at one side sent a current in swirls across the surface diagonally opposite to the ground water move-
4759 ment. It is my opinion that the movement is there, but the rate is so slow you cannot see it, and if you see it the rate of movement must be explained as increased by some other means. I have no facts that I wish to testify to as to the rate of movement. I know it is extremely slow. Its rate is of economic importance. It is so rapid that during a week or so it may change the ground water level and during a season it may change it several times, but it is not so rapid that you can see it move.

If for a number of years, back to the earliest experience of the white man, there was a substantial flow in the Arkansas river through the State of Kansas except at extremely dry times in extremely dry years, and if in each year there was such a thing known as a June rise, during which the water would rise practically bank full in the river and last from ten days to two months, and after about the year 1890 the June rise had practically
4760 gone and the river had become practically dry through the State of Kansas, I will answer that if those facts were to be determined to be true as stated, I attribute it to the taking out of the water from the river in Colorado, because I could not attribute it to anything else. (Objection by defendants.) If the average flow of the river at Cañon City is about 750 cubic feet per second of time, and if the appropriations under the Colorado law by the ditches located between Pueblo and the Colorado-Kansas line are about 3,900 cubic feet, and many of those ditches are large enough to take the whole normal flow of the river, and if during the irrigating season they do take the whole flow of the river for irrigation purposes, I would say I think that every drop of water that is taken out of the river diminishes the amount in the river and therefore the distance which the river flows. As to whether the taking of
4761 this water in Colorado would increase the number of times that the river would be dry in a series of years and would also increase the length of the time during each year, I will say that that would seem to follow, but I do not think it does. The flood

flow of the river is such an enormous volume as compared with the normal flow back far in the State where it does flow continuously, it is so greatly in excess, that when it does flow the loss from irrigation is a negligible percentage. That is to say that the
4762 floods now-a-days extend about as far as they ever have. If the ditches are not constructed so as to take the flood flow but are so constructed as to take the normal flow, out of the flood flow season, then presumably they do take it and they do influence the river valley below by just so much as they subtract from it. The floods extend from Colorado far down in Kansas. (Objection by defendants.) The normal flow as I understand it—I was not there previous to the first settlement of the country—but I
4763 understand it ended somewhere about Lakin. That is what I was considering the State boundary line. And the taking out of the normal flow of the river far back into Colorado would make the river stop farther back; but when we get well east of Dodge the river resumes as a perennial stream and its gains and losses from the far west in Colorado are insignificant. Of that I feel sure. If the flood flow were stopped in the Colorado mountains, Kansas would lose more than it loses now by the stoppage of the normal flow and the shortening of the river backward into the Colorado foot-hills. Kansas gets the floods now. (Objection by defendants.) The Colorado people cannot catch the floods. If the Colorado people could catch the floods Kansas could get nothing from the Colorado mountains, but what I wish to point out is that Kansas gets a good deal more from Kansas than from Colorado. Kansas' own contribution to the Arkansas river is very much greater than the contribution from the Colorado mountains.

Q. There is no stream flowing into the Arkansas river between the Colorado line and the Little Arkansas river that flows in at the city of Wichita, is there?

4764 A. Oh, the ground water contribution is very great, undoubtedly.

4765 Now, there is a perennial flow of that river in Colorado if we get far enough back, yes sir; and then a little ways below at some times there is no water flowing. I think that is the natural condition. As to where that water gets to I will answer that it evaporates. It cannot disappear in any other way. The normal flow, which is small. It evaporates from the point where it begins to enter back in the foot-hills where it is exposed. It evaporates from the—it is the very rim of the mountains—eastward, and the evaporation, which is small catches up after a while with the ground water contribution, which is small in that region. As I said, the gravels are carried away largely. The bed rock is largely exposed and there is very little ground water contribution to the stream there, and therefore the stream fails, and therefore it lies a
4766 little above the ground water plane. It cannot be under these conditions that the water that is lost sinks into the sand and disappears. I want to define the conditions or I will make a

very grave misstatement. Where the ground is saturated up to the surface this water flowing on the surface cannot soak into it because it is saturated. It has all it will hold. Now, where the Arkansas river flows upon saturated ground it loses nothing to the saturated ground. Where at its termination it flows finally for only a few feet on ground that is unsaturated down to a depth of several inches, there it loses a little, perhaps. It loses then to the ground water plane, just a little. But the fading stream will sometimes shoot out a little beyond the point where the ground water is just at the surface and run onto the dry land. There it contributes to the dry ground.

There is a point some little distance back from the end where I am satisfied that the river does not soak into the ground.
4767 (Objection by defendants.) For a little extent of it it does soak for a few inches into the ground, because the ground water plane is a few inches below the surface there. There is a little point there where it does soak into the ground; and the river then loses by evaporation. Now, if thousands of men say it reverses the case I have no hesitancy in doubting their word, because I know of thousands of witnesses to the statement—the sup-
4768 posed fact—that another river of the same kind, the Carson river, sinks in the Carson sink. Everybody says it does; everybody is wrong. It does not sink. The ground is saturated with water. It stands there and evaporates. Now, there is a case where those farmers, honest and fairly observant, make a mistake, and if ten thousand people were there I should not wonder if they all testified to the same thing. It looks as though it might be so. It is a case of evaporation.

As to the Arkansas river, in those cases of heavy flood the case is very different. We were first speaking of the river terminating in the usual fading away of an intermittent stream, and well
4769 west of Garden City where the slope of the ground water is toward the river. Now, when it extends away by there in flood times and saturates the ground out farther east the conditions are totally different. This would supply the underflow east of Dodge City at such times, and farther back than that, east of Garden City a little ways.

I say that the taking out of the flow of the river during the normal season in Colorado shortens the flow of the river on the surface of the ground water. I do not say it influences the flow of the ground water one way or the other. It is true that the ground water in the deep gravel of the high plains has some slight contribution farther west in Colorado, but that is negligible. The taking out of ditch water from the normal flow of the stream diminishes the length of the stream, that is all. That is the only effect that it has. And if some one takes out a ditch near Lakin, as the Garden City ditch, he has the river so shortened that it does not come down to there or has the flow so diminished that it gets less than before, and is injured; but the river, in my opinion, reaches as far as Garden

City normally, except in flood flow, and therefore nobody
4770 could be affected from there on. Eastward from Dodge City the flood flow, if the conditions were such that the river spreads widely—I think the testimony of those wells rising and falling, so much testimony is important; it indicates to my mind what I suspected when I was there and stated rather vaguely in my report—it was not a very important matter to me then—that the flood flow extending onto that broad plain eastward of Dodge City contributes perhaps in important degree. Certainly it contributes—I don't know what percentage—to the water that that region gets. That region gets a large amount of water from its own rainfall and from ground water travelling from farther westward up to say Dodge City or somewhere there, and it gets also perhaps important contribution from the floods of irrigation several miles away. I don't know how much. That is a question that ought to be carefully investigated. But I should not think the testimony of residents of much value.

It indicates a condition of affairs that seems to me to point
4771 out the truth, that is all. A June rise seems to imply an increased flow of the river from some constant flow, implying that the river has a constant flow past the point where I thought it had not. I am not sure that my judgment in regard to the river being a failing stream somewhere west of Dodge City is correct. My impression was that the river normally failed before it was settled by white men, west of Garden City somewhere, in the neighborhood of where those ditches were taken out, a little east of Lakin. My judgment was that that was the place where the stream failed in its flow, about Lakin, we will say, and therefore it could not have any June rise excepting a flood flow extending up beyond there.

If the testimony of the early settlers that the Arkansas
4772 river used to flow all the year round to and beyond Garden City and to Dodge City is correct, then I am mistaken. But I still very much doubt that there is any evidence that is satisfactory that can be obtained that the river every year—not every year of course for there might be exceptions, but nearly every year—flowed constantly past Garden City. I doubt that very much indeed. If the early river used to run in such a way as to have that June rise, it must have an immediate effect to the eastward of Dodge City.

Cross-examination on behalf of defendant.

By Mr. HAYT:

4773 During the investigation I made at Garden City in the years 1896 and 1897, chiefly in 1896, I was, you might say, a resident in Garden City. I made excursions up the river and northward. Then the next year I made an excursion out of the valley and never returned. I went as far up as Cañon City and as far down as Hutchinson, Kansas. Garden City was selected as a type locality for the purpose of making these investigations, and by

the term "type locality" I mean it was in the first place a convenient one, because there were many wells; then it was a type of that kind of a stream, as I understood that stream to be. It was midway between the point where the Colorado Arkansas river ends and the Kansas Arkansas river begins, as I put it to myself. That is, I considered that the Arkansas river rising in the mountains of Colorado naturally dwindled and finally died out somewhere in the neighborhood of Lakin, we will say, or a little west of there—and previously in all my reference to the düing-out point I was
4774 placing the Colorado-Kansas boundary about Lakin which is the first town east. I had forgotten the political boundary position. I thought it died out about there, and I estimated it began again from the ground water somewhere about Dodge, and I put it on my map, as I have said, a little west of Dodge City and Garden City was intermediate between those points. There was a span there of river bottom and there were many wells so I would not have to put down so many as otherwise. I selected it because it was wide and had its own wells and was midway between the point where the Colorado waters failed as surface waters and went into the air and where the Kansas waters began coming out of the ground. At Cañon City the Arkansas river comes out of a narrow gorge, with rock walls on either side and the solid rock but at a little depth under its sands and gravels and boulders, so that it is a cross section of "U," the sides of which are rock and there is no ground water contributing to it. To be sure, theoretically speaking, the rock is saturated too after you get in a little depth, but the water passes out of that so slowly we may regard it as holding no water or not contributing anything at any rate. Eastward
4775 from Cañon City the river is flowing over the plains and the plains are rather high on either side—the plains surface. They have been cut away increasingly eastward into tabular remnants of an old surface, and those tabular remnants diminish so in size eastward that they finally get to be an inconsiderable portion of the surface features. Then as we approach the Kansas line their size increases again, and about as we reach into Kansas the tabular tops are continuous and it is one great plain again. It was evident to me that in Colorado from the mountains nearly to the Kansas line the old covering of soft material had been worn away—washed away. That is a desert strip. It is not covered with sod, and the occasional rains washed it easily. It is covered with bunch grass, and in between the bunch grass it is washed. When you go farther eastward the climate improves and there is a sub-humid belt there where there is enough rainfall to cover the surface with sod, and that old blanket of gravel which is filled with the ground water is preserved, and there it is deep and unscoured and unchanneled because carpeted with sod. It has always been since it was built. It was built by streams in a past age, under different climatic
4776 conditions from those at present. Then as we go farther eastward the river flow increases, and the country there is

channeled again in spite of the sod. There is enough rainfall to cut it away in spite of the sod. The river bed from Cañon City eastward for a ways is practically a hard bed rock. It is gravel and sand and boulders at slight depth; and just where that hard rock bed fails I do not know. It appears again at Rocky Ford; there is the hard rock bottom exposed so that there is no body of ground water moving under the level of the Arkansas river at Rocky Ford, and at other points eastward I believe the hard rock bed is exposed. But as we approach the Kansas line the river gets to running higher above the old hard rock bed, and when we get into Kansas it is quite above and then increases in height above the old hard rock
4777 bed until it is away above. So that from the neighborhood of the Kansas line the river is running away above the old rock surface and under it is passing the ground water of the plains. Now, after you leave the Colorado line the river wideus and narrows and in some places it is between marked bluffs, again the slopes are shallow toward it, but it is always bordered by a bluff of sand and gravel, weak stuff, not rock, but occasionally rock, and the stream runs on a sand wash bed which is much wider than the current, swinging from side to side and cutting into those banks. The sand wash, that is, the wash of perfectly bare, clean sand and gravel on which nothing grows because it is so flooded over every once in a while, varies from a hundred yards to several hundred yards in width. I suppose it may be half a mile wide
4778 sometimes—the sand wash. I am not sure of that. Above the sand wash where the slope is gentle toward the river the bluffs which mark the dividing line between the sand wash and the slopes will be several feet high—six or eight feet high sometimes. It is a bank of gravel; you could dig a hole in it; or sand or clay. And the river swings in against these banks so frequently that it keeps them rather sharp—under-cutting once in a while, and tumbling them down. After we get past the point where the river is down to hard rock and is not cutting down any more, then the river characteristically widens and becomes a wider and wider sand wash, and sometimes bifurcates—divides or splits into two parts and one channel will run off here and another there, and it will come together again, or it will abandon the left-hand or right-hand channel and take one or the other, so that it is a shifting, sub-dividing, bifurcating channel at times, so that it cuts into a bank on either side and leaves a sharp bluff.

4779 I never heard the term "broken river" before to-day, until lunch time, when Professor Carpenter told me it was his term. I thought it was a very good one.

Defendant Colorado's Exhibit 23, which is plate 113, being a frontispiece to said report, is a photo-lithographic reproduction of a map made by myself—not under my direction, but my actual handiwork,—and I prepared the data for it while I was in the field and gradually added to it, and it was prepared before I wrote
4780 the report. The dotted lines on the river from about the Colorado boundary to about Dodge City indicate that in my

opinion the river is most of the year round dry through that distance. I do not think those dotted lines very approximately designate the points at which the river is normally dry. I have simply expressed there roughly the fact that there is quite a wide belt, about that wide, over which the river normally does not flow. I think I have the terminating end too far west, to tell the truth.

4781 Q. And now after your recollection has been refreshed you remember that Garden City was some sixty or seventy miles east of the State line between Colorado and Kansas?

A. I think I may state that I remember now that it was not. Of course I stand corrected. But what I had in mind was Lakin as the town on the boundary, and I remember that Lakin—because I had driven up there frequently—was only a little ways. If you had given me time to think I should have remembered then that Lakin was not on the boundary line. I have forgotten now what the town is that was on the boundary line.

I sank one well south of the river at Garden City. I went across the river just about due south of Garden City and sank one well perhaps half a mile back from the river to determine whether the ground water plane was higher than the river on that side, as I had determined that it was on the north side, and I determined that it was. Generally speaking, that investigation disclosed that

4782 the ground water plane was parallel with the surface, sloping toward the river. The uplands undulate a little; so does the ground water plane; but the ground water plane does not undulate quite so much as the surface; though in a general way the plains are spoken of as level and the ground water surface is determined to be level. The plains are quite far from level and the ground water surface is more nearly level than the plains surface as a rule. I spoke of them off-hand as parallel, but they are not quite. The ground water surface is more nearly a true plane than the other surface. But a plane is not necessarily level; it may slope or incline. The ground water surface on the upland is practically a level plane, then toward the river it slopes toward the river. The one plane slopes steeper than the other, and they both come together at the river as two planes, one dipping faster than the other. The ground water is not as steep a slope as the surface of the ground, therefore the two meet exactly at the river as the river drains down the ground water.

4783 If I am right in regard to the place, the bottom of the basin where Scott City was to have been built was higher than Garden City, but how much I do not know.

4784 I got the dates from others in regard to the times the ditches were first taken out at Garden City, and I have forgotten the dates, but I never knew about it except as I got it from others. It is likely that some of those ditches might have been taken out as early as 1879 or 1880, for anything I remember. I know my note books have the dates that people gave me, and they must have given them to me correctly. The situation at Garden

City as I remember it was that irrigation began some little time after the first settlement of the city. That first settlement began with the impression that it was a humid region, so that irrigation fol-
4785 lowed as the correction of a mistake; and I was informed that the foundations of those buildings of which counsel for Kansas spoke were laid at Garden City after irrigation had been resorted to in that locality. I remember distinctly that my information was that the later buildings and the larger ones which were built because irrigation had done so much good—their cellars were going into water at a higher level than had been the case with the earlier cellars. And as the ditches went dry for want of water the water plane, which was abnormally high, sank back again to its original condition or level, and that water worked off on its slope into the river; that is, it added to the flow of the river for a while.
4786 Oh yes, and that is the result of all irrigation to a greater or less extent. When a ditch is taken out from a stream, from that point the river absolutely loses, but when the water is applied on the land that water comes back into the ground in part and evaporates directly in part, and evaporates from leaves and foliage in part, but part of it goes back into the ground, and that gets back into the river; so that when you take ten parts out of the river you apply three parts to a useful purpose and the other seven are divided between evaporation and return to the river and the larger part I think returns to the river. I am not sure about that. I know a considerable part gets back to the river; I am satisfied of that. Yes, I should think the irrigation of large tracts of land with a drainage toward the river would have a tendency to make the flow of the river more uniform during the low water periods and would have an equalizing tendency. That is, we take water out at a point, A, and carry it opposite a point, B, on the same slope high above, and apply it there in irrigation, and all the way along
4787 it seeps out in the ground from the ditch and works back into the river. If it had not been taken out it would have gone past sooner than otherwise. But not all of it gets back; a notable amount is lost. Some gets back.
4788 Q. If I understand you, no matter what water may be taken out of the Arkansas river for irrigation in Colorado it would not, in your judgment, materially affect the flow of the river below Dodge City?

Q. Oh, yes, decidedly so. I think that whatever amount is taken out for irrigation, so long as they do not take out the flood flow. It is only the flood flow that goes through Kansas to Dodge City. So long as the flood flow is not taken, the normal flow taken out, whether it is completely or only partially utilized, has no effect east of Dodge City. I think the flood flow has a marked effect, but the other flow would fail anyway, but it would make it fail a little sooner by taking it out for irrigation.

There are quite a number of western streams that are affected in the same way. They are mostly small. The Humboldt river in

Nevada, for instance, sometimes runs through to Carson sink—improperly called sink—it is an evaporating pan. When it does not go through that "sink" it fails on the desert. If we dig
4789 into its plane we find water there. It cannot go into the ground because the ground is already saturated. And that is a good example of a river that flows so long without contribution that it loses of its substance to the atmosphere by evaporation. That is a desert river partly. The Arkansas river is, I think, such a river from Cañon City down to the point where it normally fades out, somewhere westward of Dodge City, and then there is a blank space, and the normal stream begins from the ground water east of there, and is never dry.

I have another excellent example on a large scale where the conditions are quite similar to the Arkansas, but I can't think now of the name—the river that comes out of the Sierra Madre in Mexico and flows onto the Great Plains there toward the sea is such an example. It spreads out in many radial directions and never reaches the sea except at long intervals of time many years apart, and the sea is only seventy-five miles away. It very rarely
4790 reaches the sea. It fails by evaporation almost wholly.

I am familiar with the Colorado river, but I never made a study of it. It reaches the Gulf below Yuma. It does not fail completely. It has a great many minor streams, the names of which I have forgotten, but small streams of the desert character. But some of them are large. The Arkansas is one of the larger of that sort. The Platte is not an example of that kind. Well to the south of the Arkansas river, as I have shown on my map (Defendant Colorado's Exhibit 23) there is the Canadian river. That goes through. But midway, about, between the Canadian and the Arkansas rivers is the Cimarron river. That river, right adjoining the Arkansas and parallel to it, is a fine example of that kind of a stream. It runs from the Cimarron headwaters with considerable water and gradually that diminishes, and I know very well what becomes of it. It runs through a river channel that is quite broad and well defined—a flood flow channel, as I used to call it, made by floods along the Cimarron; but normally the Cimarron fails and disappears, leaving a broad belt that is without a stream. Now, I have made soundings of the ground waters all along that for miles and found the ground water just below the surface. Exactly how far, I would not say, but in some instances above the surface. There are ground water ponds—
4791 ponds not connected—no streams between them—perennial—ponds, for the watering of stock. It is just an expression of that horizontal water plane that strikes across depressions that happen to be below it. The floods in the Cimarron frequently do not run clear through. So not even a flood will carry through in that case; but ocasionally a flood goes clear through, and the floods range so in volume that once in a while the Cimarron is known to have a strong flood, washing away corrals that are

built on the bottom land because they forget about the last flood, drowning cattle, etc., and occurring through that old river bed as it is called. Now, that is not a river bed. It is just as much a river bed now as ever. It is made by the floods that occur at long intervals. The Arkansas River bed has a gravelly wash, because it is made by yearly floods. I mean the Arkansas river bed at Garden City. It has a wash plane that carries floods every year and does not get grassed over. But the Cimarron is grazing land all through its length—the Cimarron strip. . The Rio Grande I know very little about. That is a good example sometimes. Sometimes it is a dry bed, I believe. To say that the Arkansas river is somewhat
4792 typical of many rivers in the arid region, I would hardly put it that way. The little break in there is too short. The Cimarron river is typical of the class of rivers to which the Arkansas river belongs. The Arkansas river is a pretty large dry stream. It shoots over a little interval quite frequently. There would be no discussion if the Colorado were like the Cimar-
4793 ron. The Cimarron is too striking an example.

Now, in regard to the scour hole or lake, as it was called by counsel for Kansas, near the race track at Garden City, in order to get at its explanation we should first define it. In the first place, it is not a lake, it is a pond—almost a puddle. It is a small pond revealing the ground water plane when it is full of water. We could pour water into it, and if the surface of that water we put in there is above the ground water plane at that time it will sink. If we raise the ground water plane by putting water in those old ditches again, it will rise. That slight, gentle hollow—I know very well what it is—may be below or above its bottom—below or above the ground water plane, or it may not accord with the position of the ground water plane. My impression is—I have forgotten what the facts were—that it was full of water at one time when the ditches had built up the ground water plane. But it might become a ground water pond—I have them illustrated there (Defendant Colorado's Exhibit 23)—by building up the ground water region-
4794 ally by a change of climate, and the changes of climate are sufficient in that neighborhood through long periods, and the periodic changes back again to the normal are sufficient to raise and lower the ground water plane several feet locally. We may have it raised several feet or lowered by such means as surface ditches for irrigation, etc.; we may have it lowered by pumping from the ground water, as Garden City is now doing, or they may sewer it down; but it is not being done so at Garden City, it is being pumped onto the surface and exposed in reservoir basins.

My impression is that there was no sewerage below the ground water plane when I was there at Garden City at the time of making my investigation in 1896 and 1897. Of course you could drain the ground water down very readily. It is done in eastern States. It is very easy to do that. What was done by the ditches was to build up the ground water. Now, my records through two years show

some fluctuations in the ground water level up on the uplands that were evidently the fluctuations due to varying rainfall, and
4795 that could happen in Garden City. I don't know there whether it was due to the pumping out of the ground water and its evaporation in those ponds on a large scale. They had two hundred and ten wind mills, I think, at work when I was there.

By speaking of this so-called lake as a scour hole I mean it was scoured out by the river at some time, yes sir. A scour hole that is produced by flood is necessarily so near the sand wash level that the smallest variation in the river would necessarily affect it; that is, you raise the water level and you will raise it enough to fill
4796 that hollow. A scour hole means a rapid flow, and where a rapid flow occurs gravel is transported, so that they are usually located on channel courses of coarse material. And they communicate, therefore, more readily than other depressions in the river.

Those wells that respond more quickly to the rise and fall of the water in the river I should say penetrate gravel courses of easy communication. I find that scattered wells respond at varying rates to the changes of the water level.

4797 In reference to that instance spoken of by counsel for Kansas in regard to the sinking of four wells at Wichita within the square of about twenty feet and the placing of pumps at the four corners of the square and the insertion of aniline dye in the center pump and its appearahce in one of these holes sooner than in the others, I will say I did not understand they were pumps at these corners. I thought they were merely gauge wells. If you sink a well into standing water absolutely still, which the ground water is not, only relatively still, and then pump from it you set in a current artificially all around, of course. If you pump the ground water level down at any point so as to lower the ground water level, the water flows in toward the depressed point of the ground water plane and makes what I spoke of as the cone of influence. It is over quite a large area. Now, if you pump at a central point and have wells all around it—and I did that too—you lower the water in those wells as you approach the well. I ran a line of wells from a dug well in Garden City and then pumped from this dug well very rapidly, about a few gallons a minute, and back from the pump I lowered the first well so many feet, and the next one a little less, and so on until one hundred and twenty-five feet away it was lowered only an inch and a quar-
4798 ter, and another well one hundred feet farther off was not lowered measurably. So that two hundred and twenty-five feet away there was no effect, one hundred and twenty-five feet away it was lowered an inch and a quarter, and the lowering at the central point was six feet. The first well twenty-five feet away was lowered very nearly six feet, and the next well, fifty feet away, was lowered five and a half feet, and the next, seventy-five feet away, was lowered say four feet, and you see the rise was not on a straight line, but a curve, and that was the curve of cone influence. The farther you

got away the influence was less, because you had to extend that influence around the radius of a circle.

Now, in referring to the wells at Wichita, if one pump should happen to be manned by a better pumper, and worked more rapidly, the water exhausting faster at one pump than at the others, naturally that would attract the dye to that point first, of course. I did not understand it previously. I did not understand they were
4799 pumping. I thought the water was still. It would depend on several factors there. If the ground were of uniform material, say it were of uniformly clean sand, so that the rate of travel under the same impulse was the same in all directions, it would reach one well faster than another if the pumping were faster at that well than at another; but if the material varied, even though the pumps might pump at the same rate, it would reach one quicker than another, if the material leading to that well were coarser than at the others. But if there were no pumping and the four wells and the central well were quiet, then any rate of diffusion of the aniline dye in the water ought to indicate movement away from the point to which the dye reached last. With men pumping at these four corners, without any investigation of the soil or sands below the surface, I should say the test would have no scientific value, of course. There are several factors there which ought to be considered and which seem to be wholly neglected. The test would seem to have no value one way or another.

4800 In speaking of measurements of the flood waters of the Arkansas river, of course it is an important matter in attempting to measure the floods that the stream is confined within its banks. I think I said in reply to a question of that kind that a measurement up-stream—I have forgotten where it was made—would be comparatively easy, while far to the east, where the river spreads widely, I do not see how it would be possible to make
4801 it anything like accurate. What I think about the measurements of the Arkansas river is this—that if I were asked to gauge the flow of the Arkansas river in a flood, I would choose a point where it is definitely within its banks and has not overflowed and I would expect to get a very much better result there than where it has spread widely. In fact I should not think I would be able to do anything where it has spread out widely. I should say that wherever Professor Carpenter made a measurement he would be pretty sure it would be a good one. I really do not know much about the whole subject. If you ask me which of the two measurements I would consider the better, that on a broadly spread stream or that where it was confined, I would say undoubtedly that
4802 where it was within narrow limits. As to water being measured with reasonable accuracy, no matter how much water might be flowing in the river, so long as it was within well defined banks, yes, I should think it could be done so, and I ought to add that I am not an expert on that subject. But a flood flow cannot be determined very accurately anyway. A strongly turbulent flood

flow is a good deal a matter of guess work. The normal or quiet flow of the stream is comparatively easy, and a determination by scientific men is just that much better than by the average person. After a long period of drouth and when the river bed has dried up, no water in it, I will say that all that sand that was dry would become saturated and the stream would lose to just that amount in a rise lasting two or three hours. It is a question of how deeply down it was dried. It could not be dried down deeply.

Recross-examination on behalf of complainants.

By Mr. ASHBAUGH:

4803 If the pond at Garden City that has been referred to had existed from the time the first settler went into that country down to about twelve years ago, as to how I should explain its former presence and subsequent absence, I should say I
4804 would not attempt to explain it, because I would think I didn't know all the facts, but I should want to inquire whether the region had not been flooded since then and the region silted up. As to the effect of the pumping of water upon the level of the underflow or ground water, I should answer that my understanding of the conditions is that prior to the ditching there was also no pumping from windmills; that the conditions were natural, whatever they were, and that as near as I can determine the ground water level then was a little higher than the ground water level at the time I was at Garden City. At the time I was at Garden
4805 City the ground water level was lower than it had been during the ditch period and also a little lower than it had been prior to the ditch period, because windmill pumping is exhausting it locally and has lowered the water plane from what it would be naturally. If the water level had gone down before the pumping had become general at all or material, I would say that the pumping could have produced the lowering of the water before that time, no sir.

4806 As to the aniline test at Wichita, I will say that I had assumed that such an experiment as that in pumping had been done by an engineer. It would depend on what sort of an expert he was, of course, but what strikes me chiefly about it is—I didn't understand at first it was pumping. It seems to me you are applying a test that is going to be misleading; it is going to be too delicate a thing. You could not test the spring of a watch with a coarse device.

In referring to Scott City, yes sir, it is the county seat of Scott county at the present time and is quite a little city. There are some basins north of Garden City that it seems to me are called Scott basins. I went up to the Scott basins, and the Scott basins have no town in the vicinity. If that is what you mean, there was a house there in Scott basins, and I think that house was called Scott City. I am glad to be corrected on that.

4807 Recross-examination on behalf of defendants.

By Mr. HAYT:

As to calling this movement of the ground water "percolating water," I should say that it should not be so called. The idea of percolation—the expression conveys the idea of the movement of water through interstices that it does not fill. The ground water absolutely saturates the ground and moves as a body. You put a little water onto the ground and it percolates down through the loose ground to the ground water and there it saturates the ground. Professor Carpenter is an expert on those matters; I don't know how he would use that term. My impression is that it is water passing through loose pores which it does not completely fill, and after this water gets into the moving body of ground water that water does not percolate, it flows as a body.

Perhaps it is commonly known as percolating water as distinguished from water running in underground channels, say in limestone regions that have dissolved; it runs above the underground plane. It may run as brooks and rivers, etc., in channals, in open passageways, etc. Now, the ground water is below that, and those are streams of water running between walls and in a bed. That is
different from the movement of ground water proper; that
4808 moves as a mass. The movement of percolating water would
be a great deal greater than the movement of ground water proper. It would be by gravity, you see, down through the open pores.

4810 N. H. DARTON, Washington, D. C.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I am a geologist in the Geological Survey, and have been connected with that Survey since 1886. I reside at Washington, D. C. I am not a college graduate. My lines of studies have been along geological lines. For the last eight years I have made investigations with respect to the underground or sheet waters of the Great Plains of the arid region of this country. As the result of those investigations in regard to the existence or non-existence of underground or sheet waters, I will say that the Great Plains are
4811 covered by gravels and sands which contain sheet water. That is common to the entire world, almost, where there are superficial deposits. They retain the rainfall. I am preparing a report on the underground waters in the Arkansas valley in Colorado, but have made very few observations in Kansas. I have made some in Colorado. The source of the underground waters along the Arkansas river is the rainfall and the melting snows. I think only in a very small measure it is fed by the streams which flow through the arid regions upon the plains.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4812 As to the water from the snow in the mountains getting into the Arkansas river, I will say that it melts and runs down the millions of little rivulets on the mountain slopes into the headwaters of the Arkansas basin west of Cañon City mainly, and finally into the tributaries, and carries a large volume. That is a large source of the water supply of the Arkansas river. Then on down for many miles across Colorado, and, in times of flood, across Kansas. The melting snows in the mountains are an important feature of the flowing water in the Arkansas river through eastern Colorado. I have no data at all upon the comparative amount of water that flows in the last ten years with what originally flowed in a like period twenty years ago in the Arkansas valley. I have made no such examination.

4813 Cross-examination on behalf of defendants.

By Mr. DAWSON:

I have recently made an investigation of the Arkansas river in the western portion of Kansas and in the vicinity of Syracuse, Coolidge, etc., and the ground water in that vicinity is due mainly to the water that flows on the slopes that rise out of the valley and not from the river. A small amount in the immediate vicinity of the river is present through percolation from the river bed, and by "immediate vicinity" I mean a distance exceedingly indefinite, a few rods, perhaps,—a very short distance. The general direction of the movement of the ground water in the vicinity of the Arkansas river in western Kansas is toward the river in part and in part down the valley, so that it is diagonal to the course of the river. Its movement is in a measure with the river and towards the river.

4814 I think the ground water there flows in along the bed of the stream and supplies water in that way to the river as a whole. Along at the Kansas-Colorado line the river is evidently considerably diminished as compared with the volume it has farther west in Colorado fifteen or twenty miles. It is a locality at which the river is losing its surface volume which it preserves through Colorado for many miles, and I think this loss is largely evaporation, outside of any artificial loss. I think the connection between the Arkansas river in Colorado and the Arkansas river in eastern Kansas beyond this intermediate strip is in greater part only in times of flood. I don't know whether the average normal flow of the Arkansas river in Kansas east of Dodge

4815 City is materially affected by the condition of the river in Colorado. It is true that there is a strip, as I understand it, between say twenty-five or fifty miles west of the Kansas line and Dodge City which, except in flood times, has little if any flowing water in the stream, and there is very little connec-

tion, in my judgment, between the river near its headwaters up about Cañon City or Salida in Colorado and the river in Kansas down about Hutchinson; and as to whether the normal or average flow of the river at times other than in high water periods in eastern Kansas is affected materially by the flow in Colorado on the headwaters of the river, I will say that I have only seen the district in between in which the water disappears. It is only a matter of hearsay with me, or knowledge from the maps, etc., that it reappears. Knowing that condition in between, I would think it possible that the upper fraction of the river would have no effect whatever
4816 on the lower fraction, no sir. My investigations in eastern Colorado were a determination of the geological structure more than anything else and the relation of the deep set waters of Dakota to the sandstone near the artesian basin. From Cañon City down as far as Holly in Colorado there are alluvial flats, low lands, along the river containing permeable material—sands and gravels—which contain water. But taking the general plains country lying off from the river, the rock is pretty close to the surface, and east of Lakin a short distance the Great Plains covering, this mantle which I have spoken of, comes down to the river bed and occupies part of the river valley and extends off southward from it, so that a new condition arises there, so that the river valley there receives the high plains waters. The waters of the high plains pass down onto the river bed and into the river bed. That is shown on a geological map I have there
4817 connected with my report. I have examined nearly all the rivers of the northern Great Plains. My report relates to the northern Great Plains from the Cimarron northward to the northern part of South Dakota. I have examined them all, yes sir. It is true of all but two that most of the rivers which rise on the eastern slope of the Rocky mountains and proceed out onto the plains as they leave the hilly country diminish in flow and either disappear entirely or become very much shrunken by the time they have reached out unto the plains several hundred miles. The Republican and the Niobrara really do not reach the mountains at all but are Great Plains streams. They receive leakage from adjoining valleys and therefore lack that peculiarity.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

The water shed along the Kansas-Colorado line on the south side of the river slopes to the south and away from the river, so that the level of the ground water on that side would flow away from the river on the high plains, but not on the river bottom itself. There is a rock barrier. I did not observe that the river decreases in volume to any material extent naturally, not taking into consideration irrigation, but naturally, from Pueblo down to Lamar. From Lamar down to about to Coolidge it shows very perceptibly the

diminution, and by the time you get to Syracuse or Coolidge a very large part evaporates. I cannot explain how it happens to all evaporate right from that place and does not evaporate above it.

Recross-examination on behalf of defendants.

By Mr. DAWSON:

4818 The declivity of the river channel diminishes regularly or almost regularly through Colorado and to far east in that State, and the more slowly the stream runs and the more it is spread over the sands the more opportunity there is for evaporation. Besides, it receives affluents in Colorado sustaining its volume.

4820 ALEXANDER OSWALD BRODIE, Washington, D. C.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I reside in Washington, D. C., at the present time, and am a major in the United States Army. I resided in Arizona
4821 twenty years, perhaps. I was governor for two years and seven months. I had been a considerable part of the time mining and civil engineering before I became governor. I am pretty well acquainted with Arizona's physical resources. When I went there there was somewhere from six to nine thousand population; at the present time there is 170,000.

The present assessed valuation is forty-five millions, about.

Arizona is in what is known as the arid belt. Generally speaking, the average rainfall in Arizona is not sufficient to raise crops without the aid of artificial irrigation. When I went to Ari-
4822 zona I don't imagine there was a thousand acres under irrigation—not over ten thousand acres anyway. At the present time I should say there is in the neighborhood of 350,000 acres under irrigation. Before irrigation the land was valuable as grazing land, some parts of it. $1.25 would be a very fair price for it in that condition. The average value of the whole land that is now irrigated there would be from $30 to $50 an acre. I have heard the
4823 statement made that on the Arizona side of the Colorado river from that stream there could be reclaimed about 300,000 acres of land from the unused waters of that stream, which stream divides and separates California from Arizona and also Arizona from Lower California and old Mexico for a short distance. Outside of the land that could be reclaimed there they had one project on a reservoir for the storage of flood waters which would probably add to the amount included in my estimate about 50,000 acres. The San Carlos reservoir, should it be constructed, would probably add 50,000 more. There are several other ten or twenty thousand acre projects. As to the land which can be reclaimed, it is doubtful if it has any

market value at all without water. It would not be valuable except for grazing land, and some of it has no value for that
4824 purpose. It is what is known as desert land. The land I have spoken of that can be reclaimed is all Government land. There is some that could be reclaimed below the San Carlos reservoir that has been put under old canals. I would say that twenty acres of irrigated land in Arizona would support an average family of five.

If the doctrine should be enforced in Arizona that the waters should be permitted to run unaffected and unrestricted except for reasonable use for domestic, manufacturing and power purposes the reclaimed land in the different valleys there would go back to the desert, I imagine, if they were prohibited from the use of the water, and there could be no future development along irrigating
4825 lines except, as I understand it, the people or any company are allowed to store flood waters above the natural flow of the stream. There would be a certain development from that.

Lands in the Salt River valley, some of them, bring as high a price as $100 to $150 an acre. There are some lands that go above that. The main crop in that section of the country is alfalfa, raised for forage and for pasturage, and grains—wheat, barley, etc. Yes, we raise some oranges and tropical fruits. In the fruit line are apricots, oranges, peaches, apples, plums, dates, etc.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4826 The Gila and the Colorado rise in other States and flow into Arizona. The Gila rises in New Mexico.

There is a tribe of Indians down there called the Pima Indians. The greater part of the tribe is located at Sacaton, which I should judge is about the middle of the stream, in length. The Gila river is about 700 miles in length and this Pima reservations is about 200 miles from Yuma, at the mouth of the Colorado. To my knowledge, they have been irrigating lands around the Pima reservation since 1870. They have had a shortage of water in all the streams in the Territory, and they had perhaps as much shortage in the Gila lately as in any other stream. There has been a drouth prevailing over there off and on for about ten years. There has been a failure of the snow supply in the mountains. This has diminished the supply of water, and the locators and farmers at Solomonville in the valley of the upper Gila have taken the first water that has come along, and that has crippled the valley at Florence and below that at Sacaton. I suppose if they had allowed what
4827 water came down the stream during this drouth to flow, the Pima Indians would have had enough to irrigate their lands. The shortage has been all over the Territory. Relief has been asked by the Pima Indians of the Government, and I suppose the matter is still pending. The cause of that shortage has been the

excessive drouth that has prevailed there in the last few years.
The lands above were irrigated before the drouth came and
4828 when the Indians had sufficient water. I don't agree with
you that the cause of that shortage is the taking out of the
waters above that they had been accustomed to use before. For
these Indian lands they had the right of prior appropriation. Yes,
the taking of the water above has added to their injuries from loss
of water. That would make it appear right, because all their loss
has not come from the taking out of the waters of the river for irri-
gation. The whites have suffered as much as the Indians, but it
has come from the drouth as much as from the irrigation above.
The irrigation above was later than the irrigation at the Pima In-
dian reservation. Yes sir, if the amount of water during these
later years that the Indians in the first years had appropriated had
been allowed to flow down to them their injury would not have been
what it has been during the last few years.
4829 I mean that all people in the Territory who were irrigat-
ing land were suffering from this protracted drouth. The
Indians had supplies at this time, and later when the rains
came in this last season they commenced to sell their stored grain.
The Colorado river is formed by the junction of two streams up in
either Colorado or Utah. I have never been on the head-
4830 waters of the Colorado river, but I believe it to be impossible
for the State of Colorado or any other section through which
the Colorado river runs to divert all of the waters of that stream.
If all of the waters, however, should be taken in the State of Col-
orado that now flow down across the line into other States and ap-
plied for irrigation, I would say that if the Colorado river was per-
fectly dry below, there would be no irrigation along it and
4831 the land would revert to the desert. (Objection by defend-
ants.) If all the waters of the Gila river should be taken in
New Mexico it would have a very small effect in Arizona, as the
main source of supply of the waters of the Gila comes within the
limits of the Territory of Arizona. As a rough guess, I should say
that about one-tenth of the waters of the Gila rise in New
4832 Mexico. As to what effect it would have upon our present
irrigation interest if people above the point where the water
is now diverted should take all of the water flowing in those streams
and apply it to irrigation, I should say the effect on irrigated land
below of the deprivation of the water for irrigation would be to
send it back to a desert condition. (Objection by defendants.) The
vested rights of the people who have already irrigated land would
be better protected by protecting the rights of the first parties who
have appropriated and used that water. (Objection by defendants.)
The interest of newcomers might be equal if they were in the same
territory, if they had the same use of the water. (Objection
4833 by defendants.) The only way that the irrigated area in
Arizona can be increased is by taking and impounding floods
and excess waters that have not heretofore been appropriated (ob-

jection by defendants), and the protection of the forests on the water sheds.

Cross-examination on behalf of defendants.

By Mr. HAYT:

I was lieutenant colonel of the Rough Riders, and succeeded President Roosevelt as lieutenant colonel.

A great diversity of crops can be raised in Arizona by irri-
4834 gation, much more so and a larger yield per acre than in the humid regions without irrigation. I imagine that the most valuable lands for irrigation in Arizona are in the Salt River valley. It is alluvial land, and perhaps there is less alkali there than in other irrigation sections. The farmers there have found the raising of alfalfa to be the most profitable and at the least expense. They also raise dates, oranges, peaches, apricots, apples do well, pears, plums, and all those fruits are raised successfully. I should judge an orange orchard with trees five or six years old would be
4835 worth perhaps $500 to $800 an acre with water rights. Outside of the oranges, I imagine the fruit lands with water for irrigation would run from $100 to $150 an acre. I should not like to put the number of acres at less than twenty, of those lands cultivated to oranges with plenty of water, to the support of a family. In that section of the world the railroad freights eat up the profit and the orange business does not afford so very much profit. We have had a serious drouth for about ten years since we have had no snows in the mountains to amount to anything or any good flow of water in the streams in the summer season. It has been about ten years of steady drouth, and this has extended generally over the State and over New Mexico to a certain extent, as far as I
4836 have been advised.

There are about three thousand people in the Pima reservation, I should think, and then they have a small reservation near Phœnix. The area under cultivation is very small considering the population. The shortage of water in my judgment was occasioned by both the drouth and the taking of water out above. The drouth cut down the supply of water in the stream until it was virtually a dry bed past Sacaton. It also cut it down until it was a dry bed and the land had gone back to the desert at Florence just above there, and it crippled the people in the upper Gila valley in the same way. The drouth had crippled not only the Pima Indians but every interest in Arizona outside of mining. Of course if all the water in the Gila river had been allowed to
4837 go solely to these Indians they would perhaps have had enough to irrigate their land. It is hard to estimate the trouble caused by drouth in cases of that kind, whether it entirely comes from that or from other things. My understanding is that the alleged distress of these Indians was greatly magnified for the purpose of accelerating this reservoir scheme. I believe, of course,

that aid should be given to the Pima Indians and they are already doing it by way of putting in pumping plants and raising water to the surface, and this has proven a feasible scheme so far. It is expensive. I don't think from what I know of the Colorado river that irrigation within the State of Colorado could have materially reduced the flow of that river in Arizona.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

There is a project under construction under the reclamation service along Salt river known as the Tonto reservoir.

4838 As to the population that is now dependent upon the irrigated lands in Arizona, I should think it would range from thirty to fifty per cent.

I am originally from New York State, St. Lawrence county. Irrigated lands will produce more per acre and support a denser population than lands in the humid belt depending on rainfall

4839 altogether. Well, in the near future irrigation will tend to reduce the holdings of land. It has not done so in the past. The reason for this is that it takes so much capital to irrigate, especially in our Territory. In our Territory it has taken a great deal of land, and they must have quite large bodies of land where they can get it, but the general tendency is toward reducing the amount of lands held by each individual.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4840 I can only say from rumors I have heard of some little complication between this Government and the Republic of Mexico over the flow of the Colorado river down there. (Objection by defendants.) There are no such contentions that I know of on the Gila. The Colorado river is considered a navigable stream. It is a navigable stream. I don't know anything about the Rio Grande.

Recross-examination on behalf of defendants.

By Mr. HAYT:

I do not know that this controversy I have mentioned has been fostered and promoted by persons in southern California who desire the water for irrigation purposes. I think not. They have a canal taking out water around through old Mexico and into the interior of the country in southern California, and I think the proposition of that concern is to sell it to the Government when they take up the reclamation work on the Colorado.

4841 JOSEPH L. B. ALEXANDER, Washington, D. C.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I have resided at Phœnix, Arizona, for twenty-one years, and am an attorney at law of ten years' practice at Phœnix. I am very thoroughly acquainted with Arizona, its climatic conditions, its rainfall and its resources. I know the developments that have been made there along agricultural and horticultural lines. It has been developed mostly through irrigation. The rainfall in Arizona, generally speaking, is not sufficient to raise a crop without irrigation. We could not depend upon rainfall for crops. The future development along agricultural lines in Arizona is dependent entirely upon taking the waters out of the streams and ap-
4842 plying them to the lands for irrigation. As to the amount of land which can yet be reclaimed and developed by irrigating reservoirs and storing the flood waters, I would say there are several schemes in the course of construction there. There is one at Yuma, and one known as the San Carlos Reservoir project. I understand in the Yuma project there could be irrigated 150,000 acres, and under the San Carlos project a like amount of land.

I know what is understood by the doctrine of riparian rights. The development which has been made in Arizona along agricultural and horticultural lines could not have been made if that doctrine prevailed there, nor could any future development be had. That is, I say there could not under the present—if you should depend upon the flow of the stream for irrigation. Should the
4843 irrigated area be confined to lands bordering upon or adjacent to the stream, within three-quarters of a mile therefrom, the effect upon present development would be to destroy it, of course. That is, the development of land that has already been placed under irrigation. And in respect to future development, it would retard it—prevent it, of course.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

If some parties should go above us on a stream and take all of our water, it would destroy all that we have done. Under
4844 our system in Arizona and under our statute no one could go ahead of us and take any water, for we could get them enjoined and let the water go by. They could not get the water away. We have some very good laws.

Cross-examination on behalf of defendants.

By Mr. DAWSON:

The old Spanish system which of course obtained in Mexico when we obtained this territory under the Gadsden treaty, we took those laws and have enlarged upon them, and those laws provided, in times of scarcity of water, that the oldest titles to the oldest fields shall have the first use of the water.

4846 F. H. NEWELL, Washington, D. C.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I am chief engineer of the reclamation service of the Geological Survey. My legal residence is at Bradford, Pennsylvania, and my official residence is Washington, D. C. I have been connected with the Geological Survey since October, 1888, and have been chief engineer of the reclamation service since July, 1902,—since its formation. I was educated at the Institute of Technology in Boston, in engineering. I was first appointed assistant hydraulic engineer and began the measurement of rivers in the West, particularly
4847 the Rio Grande, and from that to the Arkansas, Platte and other streams of the West. The results of that gave the flow of the streams, the opportunities for water storage and for the development of the West, the object being summed up in the act of Congress to investigate the extent to which the arid region might be reclaimed by irrigation. This work was practically done by me and under my direction, and I believe this investigation aided in the passage of the act of Congress known as the reclamation act. During the first few years of my connection with the Geological Survey I was practically all of the time in the field, and a gradual decreasing of field duties until at present about one-half of my time is spent in the arid region.

In the performance of my duties I began investigations in regard to the sheet water in the arid plains, and the details were gradually turned over to assistants, I supervising the work in a general
4848 way and compiling and studying the results. The investigations made by Mr. Willard D. Johnson, who has just testified, were made under my direction.

Sheet waters or underground waters in the arid part of the United States are similar in occurrence to those throughout the world. Wherever there are beds of gravel or sand, ancient buried streams, channels or lake beds, they are as a rule saturated with water, excepting where the climate is so extremely arid that they cannot receive any, but in the Great Plains region, and throughout much of the country the so-called sheet water exists and has a definite, perceptible movement which we are now detecting by means of elec-

trical apparatus devised by Professor Slichter. This underground or sheet water extends along the valley of the Arkansas river as a part of the general sheet water underlying the entire plains
4849 area. Yes, I have made investigations with respect to the sheet or underground water along the Arkansas river in Colorado and Kansas. In regard to its source, as a rule it is derived most largely from local rainfall, as testified by the fact that the great body of the sheet water is at a higher level than the level of the rivers as a rule. I personally visited the Arkansas river from its headwaters at various times down to and below Wichita, and have directed the movements of field parties and visited those field parties at intervals. No, these investigations have not been completed. We will continue them indefinitely, with the object ultimately of constructing works for bringing water to the surface if they
4850 are found commercially feasible. Yes, Professor Charles S. Slichter, who is connected with the State University of Wisconsin, is at the present time making investigations there.

I have heard most of the testimony of Mr. Willard D. Johnson in this case.

Q. Did you hear his testimony where he stated that there were practically two Arkansas rivers—one in Colorado, which rose in Colorado and gradually faded out to the east of the Kansas Colorado line, and then a new river began east of Dodge City, which received its source of supply in Kansas, and that between these two points it was an intermittent river?

A. Yes sir.

Q. Now, just give us your best judgment with respect to that matter.

A. My opinion is substantially in accord with that of Mr. Johnson. I think he emphasizes a little more strongly than I should the fading out of the upper river, but for the purposes of study and description his idea, I would think, is substantially correct. There is a perennial river above, an intermittent river below, and then a perennial river still lower down.

4851 Whenever the upper river was in flood and there was a considerable flood flow the diversion of the upper waters would undoubtedly have an appreciable effect on the lower river. When the river was at its lowest stage and it was possible that its waters would entirely disappear before getting down into the vicinity, say, of Garden City, presumably there would be very little effect from taking it out entirely in Colorado.

Since being connected with the Geological Survey I have paid particular attention to the possibilities of the arid region in this country. Since 1894 much of my time has been given to the study of the extent to which the arid region might be reclaimed by large hydraulic works, and I have spent most of my time in travelling, investigating possible reservoir sites, mountain waters, the present works already constructed, and the arid areas which might be re-

claimed by full development. I think I have visited nearly
4852 every county in every State and Territory of the arid region. The arid region is that region where the rainfall is less than twenty inches per year, but it is better defined as the region in which the ordinary commercial crops as we now know them cannot be produced habitually without the use of the artificial application of water. As such it would extend from about the 102d meridian in Kansas westward to the Pacific coast, excepting the wet area of western Oregon and Washington. Up to the present time, as shown by the census investigations, there have been irrigated upwards of ten million acres within the arid region, and a population of approximately three million persons is dependent upon them. It is probable that by complete storage of all the flood waters, by pumping water from under
4853 ground, and by the most thorough application of water to the soil, upwards of fifty or sixty million acres may ultimately be reclaimed, and if that is done within the next generation or century it will probably result in a population of one person to two acres irrigated or one person to one acre irrigated, or, roughly, fifty millions of people may be supported in addition to the number now within the arid region. This land in its present condition is almost valueless. It has a price of $1.25 an acre as a rule, and much of it is not worth that. Under intensive cultivation and thorough irrigation, with an added population such as we may expect, the land should rise to upwards of $100 an acre, and under favorable climatic conditions it may rise to several hundred dollars an acre; that is, under the best conditions and moderate temperatures.

I have been particularly interested in the doctrine of riparian rights and the decisions, as I have been able to read them, which depend upon that in the different States and Territories. It
4854 is highly improbable that under any such doctrine any development along agricultural or horticultural lines could have been or could be made in the arid region, and probably not over say ten per cent. of the present area could have been irrigated under riparian rights from the streams. Such a doctrine would practically arrest all future development, as the lands now easily irrigated along the streams are pretty well developed. Should it be established that the irrigated area in the arid region should be confined to lands adjoining the stream or within three-quarters of a mile thereof, it would arrest further development, as most lands bordering on the streams are now fairly well irrigated.

4855 Yes, I am acquainted with the provisions of the reclamation act, and I am the person under whom that act is being administered. I have studied it very thoroughly, and have in charge the direction of the work and the expenditure of thirty millions of dollars under the operations of that act. If the doctrine of riparian rights should be enforced in the arid region, or the doctrine that the irrigated area should be confined to lands within three-quarters of a mile from the stream, such doctrines would practically nullify the act. We would not be able to erect any of the

works under construction. The amount of money now in the Treasury accumulated there on the 30th of June, 1904, under the provisions of the reclamation act, is a little over twenty-four million dollars. Since then there has been considerable of an increment accrued, and plans are being made to expend about thirty million dollars, because of the fact that by the time those plains are matured, that money will undoubtedly be available.

4856 In Arizona, investigations have been made of each of the river systems, and out of several projects where feasible, each involving an expenditure of several million dollars, selection has been made for first construction of the Salt River dam on the Salt river at the mouth of Tonto creek, flooding what is known as the Tonto basin and storing the entire flow of Salt river, allowing only water for prior rights to escape. That project has now involved the expenditure of about a million dollars on the construction of the preliminary works, power canal, cement mill and similar structures, and bids have recently been opened for the construction of a large dam, one of the largest in the world, which will cost a little over a million dollars. The total expenditure to be made will run up to between three and four million dollars, and at least 180,000 acres of land now arid will be made highly productive, and possibly 200,000 acres, and when irrigated it will presumably have a value running from $100 upwards, depending on the character of the crop

4857 which is planted. That work is now well under way and construction will be completed in two or three years if nothing prevents. When that is completed, if the funds coming from that are returned to the Treasury promptly as required by law, they will presumably be used in the construction of a similar large dam on the Gila river at the San Carlos or a similar site, and that dam will render possible the irrigation of a hundred thousand or more acres of land; and so on step by step it will be possible to expend in Arizona in the next generation thirty millions of dollars in the reclamation of arid lands.

In California work has been begun on the Yuma project, which involves the irrigation of lands near the lower part of the Colorado river, on both sides in the State of California and the Territory of Arizona, in the vicinity of Yuma. This involves some international problems regarding the control of the Colorado river, but matters have advanced to a point where bids will be received on March 15, for a dam across the Colorado river which will cost upwards of a million dollars, and about three million dollars will be invested in the reclamation of about 80,000 acres of land having a climatic condition such as the most expensive crops known to the world can be raised. It is the country of the date palm, the olive, where alfalfa has been raised to the extent of eleven cuttings each year,

4858 and where five acres under cultivation is an ample area to support a family.

Another project in California is that on the northern end of the State, adjacent to Oregon, and is an inter-state project known as the

Klamath, in which water is stored in lakes in Oregon to reclaim lands in California, and other waters are stored in California to reclaim lands in Oregon. It so happens that the State line divides the project in such a way as to make one portion dependent upon works in the other State. That will also involve an expenditure of upwards of two million dollars and reclaim at least a hundred thousand acres of land, dependent upon the extent to which some of the marshes there are drained. There is also in California, in the central part of the State, the Owens valley, receiving water from the high snowclad Sierra Nevada mountains. There are reservoir sites in those mountains where water can be stored and utilized on the arid lands around Owens lake, reclaiming possibly seventy-five thousand acres of land at a cost of thirty dollars an acre. These figures are all approximate.

In Colorado the project now under construction is the Gunnison tunnel, taking water from the Gunnison river to the Uncompahgre valley in the vicinity of Montrose and Delta. A contract has been let for a tunnel thirty thousand feet in length, one of the
4859 longest tunnels in the world, to bring the entire flow in ordinary stages of the Gunnison river and to distribute it on approximately one hundred and ten thousand acres of arid lands in the Uncompahgre valley. Already the canal system has been built in part and work has been begun on the tunnel. In addition to that in Colorado it is practicable and the money is available to construct works for the reclamation of at least sixty thousand acres in the vicinity of Grand Junction, and other projects are under consideration which will reclaim from a hundred thousand acres of land upward, on the rivers of the extreme northwestern part of Colorado. So that after one project is completed in the State, if funds are then available it will be possible to continue for an indefinite time to construct other projects on the western slope of the continental divide.

In Idaho work has been begun on what is known as the Minidoka project, which consists of a dam across Snake river, raising the water and carrying it out to about ninety thousand acres if arid land. A large amount of water power is available at this dam, and it is proposed to use that power for pumping water to additional desert lands which cannot easily be reached by gravity. The work on the dam is now well under way, and approximately one hundred thousand acres will be irrigated, at an estimated cost of twenty-six dollars an acre. In addition is a large project known as the
4860 Payette-Boise in western Idaho, which combines storage and diversion of the Payette and Boise rivers and irrigation of upwards three hundred thousand acres of land westerly from Boise, reaching to the valley of the Snake river.

There is a third project in Idaho, near the head waters of Snake river, which will reclaim several hundred thousand acres of desert land on which there is absolutely no habitation at present, and the area to be reclaimed is limited only by the water supply. It is

probably that by storage reservoirs in or adjacent to the Yellowstone park upwards of three hundred thousand acres can be watered.

In western Kansas plans are being made by Professor Charles S. Slichter, and will be passed upon by a board of engineers at Denver in a few days, involving the pumping of the underflow in the Arkansas valley west of Garden City. It is possible that a demonstration plant can be erected there if the present land owners will give the Government a suitable tract or mortgage on the land such that the cost of the plant will be returned in ten annual installments in the same way that the cost is returned for all these other projects.

The Montana projects nearest construction are the Huntley, near Billings, Montana, taking water from the Yellowstone river and reclaiming about thirty thousand acres of land on what was the Crow Indian reservation, at a cost of about twenty-five dollars per
4861 acre. Bids for that will be advertised in a few days.

Also down the Yellowstone is the Buford project, taking water out of Yellowstone river a short distance above its junction with the Missouri river and irrigating sixty thousand acres in Montana and twenty thousand acres in North Dakota. In addition, extensive surveys have been made of the Milk River valley in the northern part of Montana to reinforce the water supply of Milk river by storage in Saint Mary's river which now flows into Canada. This involves an international difficulty with Canada, as the Canadians recently constructed a canal from Milk river which may seriously interfere with the present use of water in the Milk River valley, and there is thus brought in an international question involving diversion of streams as between different nations. There is also under survey in Montana the Madison River project for taking water from Madison river, and various other opportunities, so that as rapidly as one project is brought to a conclusion if money is available other work can be pushed forward for an indefinite future—at least a generation.

In Nebraska the principal operations are confined to the vicinity of North Platte where on each side of the river are extensive tracts of land back from the river several miles which can be reached by canals heading in Wyoming and taking the water of North
4862 Platte river out upon the bench lands, especially those north of the river in the western part of the State. The water of the North Platte is now largely appropriated and storage must be resorted to in Wyoming, and already work has been begun on what is known as the Pathfinder dam in central Wyoming on North Platte river. This will store the entire floods in Wyoming, with the object of distributing the water in Wyoming and in western Nebraska.

In Nevada construction has advanced more rapidly than elsewhere and it is hoped to put water on about twenty thousand acres of land in April of the present year. About four million dollars

will be expended in taking water from Lake Tahoe, which lies partly in California, regulating the outflow of this lake, conducting the water through a portion of California into Nevada, then diverting it over into the Carson River basin and combining it with the Carson floods, distribute it out upon the Carson sink, where there are nearly half a million acres of arid desert which may be reclaimed and rendered highly productive to the extent of the available water supply. It is believed that the population of Nevada can be increased from its present amount of about forty thousand to two hundred thousand. In addition, projects are being examined on Walker river, showing the possibility of reclaiming at least a hundred thousand acres
4863 in addition, and on Humboldt river, where, with complete regulation, possibly a hundred thousand acres more can be reclaimed.

In New Mexico construction has been begun on the Hondo reservoir in the vicinity of Roswell, and about twenty thousand acres will be irrigated at an early date. On the same river system, the Pecos, examinations have been made of what is known as the Urton lake, where the floods of Pecos river can be stored and also the present irrigation system near Carlsbad is being examined with a view to providing a comprehensive system of water storage for the entire drainage basin. On the Rio Grande in New Mexico and in Texas studies have been carried on and a solution proposed for the international troubles concerning the distribution of the waters of the Rio Grande, and plans have been made for a dam which will store the entire flow of the river at a point in New Mexico near what is known as Elephant Butte. The recent legislation by Congress permits the cost of this work to be borne by lands in Texas as well as in New Mexico. Also in New Mexico investigations have been made on San Juan river, in the extreme northwestern part of the State, showing that an extensive area can be irrigated, and also near Las Vegas and at various other localities, so that in this Territory as well as in others, many millions of dollars can be profitably expended in the reclamation of arid areas.

4864 In North Dakota, the principal irrigated area, by gravity, is that which is described under the head of Montana as the Buford project, taking water from the Missouri river, and plans have been made and about $550,000 have been set aside provisionally for the construction of pumping plants near Williston and Trenton, on the Missouri river.

In Oklahoma, surveys have been made and plans tentatively drawn for water storage on the headwaters of Red river to irrigate land in Gregg county, in the vicinity of Mountain park. About a million dollars has been provisionally set aside for this work. In addition, it may be practicable to store waters on Beaver creek or Cimarron river for the reclamation of lands in Beaver county or in the extreme southwestern corner of Kansas.

In Oregon, plans have been made for a large reservoir on Malheur and Oyhee rivers, in what is known as the Malheur project, for the

reclamation of approximately one hundred thousand acres in the vicinity of Ontario.

The Klamath project has also been spoken of under the head of California, and in addition is the Umatilla, for storing waters of the Umatilla river in the northern part of Oregon. There are also a number of other field projects scattered through the interior of the State and practicable whenever funds may be had.

4865 In South Dakota, work has been begun on the Belle Fourche project, north of the Black hills, for diverting Belle Fourche river to cover 80,000 acres of arid land extending northeasterly from the base of the Black hills. Besides this, there are other projects east and south of the Black hills.

In Utah, the principal projects involve the lowering of Utah lake and the conservation of its waters, and of Bear lake on the northern border. There are also possibilities of diverting water from Duchesne river by tunnel easterly to lands in the Utah Lake valley, and of the storage of the water of the Weber river to reclaim lands near Ogden.

In the State of Washington, the principal project approaching completion is the Palouse, for the irrigation of upwards of 100,000 acres of land of low altitude near Pasco. In addition, there are also a number of large projects under examination.

In Wyoming, besides the Pathfinder dam spoken of under the head of Nebraska, is the Cody project for reclaiming arid lands in the Big Horn basin near the town of Cody by storing the waters of the Shoshone river; and there are also a considerable number of smaller projects there which are feasible.

4866 The fund is being added to by the disposal of public lands so that if all the money comes back to the fund and additions are make to it it will become a very large amount and will result ultimately, under good administration, in the reclamation of all of the arid lands not otherwise taken care of. It is impossible to continue the work unless we are permitted to use the waters of streams for irrigation, in fact it is based upon the assumption that all of the water wherever it is found may be held in reservoirs and completely utilized, respect being paid only to prior rights of appropriation and beneficial use. About three hundred thousand acres of land are under irrigation and have been developed by means thereof in Nevada up to the present time.

4867 It is probable that the irrigated area around Carlsbad, New Mexico, could be doubled or trebled without interference with the Urton Lake project which I spoke of.

4868 As a rule, the better lands are on the benches back from the stream, and they are less likely to be injured in the future by seepage or alkali than the bottom lands. It is very difficult to generalize, but as a rule it is less expensive to take out a large canal and cover it to a considerable distance back from the stream, and thus get a compact body of land than to take it out in little ditches right in the bottom itself.

4869 I have taken great interest in forestry and in forest protection, and have been secretary of the American Forestry Association for a number of years and have also served on a commission appointed by the President consisting of the Commissioner of the General Land Office, Mr. Richards, and the Chief Forester, Mr. Pinchot, and myself, to study the whole question of public lands for the administration, and in connection with that the questions of forest preservation and their effect on the stream flow. It is believed that the forested area can be increased by adequate protection, occasionally by planting, and by a proper use, so that the right timber is removed and the young growth allowed to remain, and that a considerable extension of forests is not only feasible but necessary. Forestry aids irrigation, as the forest areas are those near the headwaters of a stream where the land has practically no value for agriculture. The production of wind-breaks and of shade trees of course is dependent upon irrigation, but that is hardly classed under the head of forestry; that is simply tree planting.

4870 Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

Yes sir, there are difficulties before the reclamation service between the different States and between this Government and other governments. I should hardly call them difficulties, but international agreements must be reached, and as a rule they are amicably adjusted by mutual understanding. (Objection by defendants.) In the case of the Rio Grande in New Mexico there are international difficulties with Mexico; in the case of the northern border there are complications with Canada; but between the States there are—you might call them difficulties—there are questions which must be settled as regards the division of water within the State boundaries and across them. Canada has already given to

4871 a company the water of Milk river, and that company is proposing to take it out to the detriment of present settlers in the Milk River valley in northern Montana. (Objection by defendants.) The present settlers on the Milk river in Montana are prior appropriators to the ones who now propose to take it in Canada. (Objection by defendants.) I understand this difficulty is before the State Department. I understand that there is also some difficulty as to the diversion of waters in Arizona and California that subsequently go into Mexico, which is now pending before the United States Government, as between those two governments. (Objection by defendants.) The solution of the difficulties between California and Oregon, Colorado and New Mexico, Wyoming and the Dakotas rests largely on agreement and mutual self-interest. (Objection by defendants.) In the case between Oregon and California there must be mutual concessions in order that either may secure any benefit. In the case of Wyoming, there is not enough land within reach of the stored waters of the North Platte to utilize all the waters, and

the large reservoir would not be built in Wyoming except for the
fact that there is land in Nebraska which will contribute to
4873 refund the cost of that reservoir. In each case the projects
have been considered on that line of feasibility, as shown by the fact that mutual self-interest forces a compromise. In each of these cases we have carefully avoided the condition named, that the self-interest of the upper State should be such as to enable it to take all of the waters of an inter-state stream, and are awaiting with interest the outcome of this present discussion. If such a condition should arise we would simply wait until this suit between the States is decided to settle the principles upon which future projects may be considered. Assuming that it were possible to utilize all of the waters of the Missouri and Yellowstone rivers in Montana, and assuming that that should be done, it would obviously destroy
4874 the irrigation possibilities in North Dakota. (Objection by defendants.) Assuming that that were true in each of the other upper States, it would of necessity destroy the irrigation possibilities in the lower States, so far as those are dependent on the waters that come from those States. (Objection by defendants.)

We, in the administration of the reclamation service, have tried to avoid the difficulties and are vitally interested in securing the establishment of a principle on which we can take up these questions in the future. If it should be established that the upper State
should have the right to take all of the water of an inter-
4875 state stream that falls within her borders, it would necessitate a readjustment of many of these projects and in some cases an abandonment of lands which, as to low altitude, are perhaps a little better situated climatically, and it would practically contract the application of the reclamation act to those upper States so far as the physical possibilities extend. (Objection by defendants.)

In my description of the projects hereinbefore enumerated, I will say I do not think any of these would be materially affected, because they have been selected largely with that principle in view—that we did not wish to bring into doubt or question the relative State appropriations and have chosen those where the conditions
were such that the physical facts prevented any interference
4876 or the raising of that question. This present suit or the discussion concerning it was in effect before the reclamation act was passed and has always been borne in mind in the outlining of these projects.

I am acquainted with the Garden City ditches, and have been over many of them. It is my general impression that they were taken out from about 1879 to 1883 (objection by defendants). As
to the effect of the taking of waters in Colorado from the Ar-
4877 kansas river since 1884 upon the water supply that before that time had been applied to irrigation in the Garden City district, I will say that (objection by defendants) in my opinion the diversion of the water above has unquestionably reduced the amount which those ditches might have received. We have no

records to show the amount of water in the Arkansas river prior to 1888, I think. The first measurements were made in 1888 up in the vicinity of Pueblo and above that, and in 1889 more or less desultory measurements were made along the river down as far as Kansas and systematic measurements have been conducted at a few points since 1888 with a fair degree of completeness, but very few facts relating to the river in Kansas have been gathered.
4878 I was first in western Kansas in 1882, and I think our first actual measurements there were a few about 1890 that were desultory, and the systematic measurements were made at the time Mr. Willard B. Johnson went in, about 1896 and 1897. These investigations I assume were all made quite a while subsequently to the appropriation of the water in the Arkansas river in Colorado. My opinion would be that the effect of these appropriations in Colorado has been progressive rather, that the early construction did not bring under irrigation as much land as is now irrigated. (Objection by defendants.) If the evidence in this case shows that the practice of appropriation on the Arkansas river in Colorado was begun about 1885 and was continued down to
4879 about 1892, increasing as those years progressed, then I would say that the examination that Mr. Johnson made was after that and that much of that effect had been produced in the valley below before he made his examinations. If the evidence in this case shows that seventy per cent. of the water that passes through eastern Colorado and down to the State line is lost by the time it gets down to Wichita or Hutchinson, as to where that water goes and as to what becomes of it, I should say in reply that I should doubt the evidence. (Objection by defendants.) I should want to study that very carefully. Of course if the evidence is incontrovertible then the water must have disappeared most largely by seepage into the ground, as the loss by evaporation would presumably be quite small. If the evidence in this case shows that in May, 1904, there were 10,000 cubic feet of water per second in the river at the Kansas-Colorado line, and that by the time that water got down to Hutchinson the flow has been reduced to about a thousand feet, as to what became of that water, I will say that if there
4881 was an actual decrease of the volume at one point as against the volume for an equal length of time, say a month, at another point, then it must have disappeared into the ground, and a small proportion, perhaps, went into the air. I think I was down about Wichita and in that immediate neighborhood there about five or seven years ago and visited the Arkansas and the Little Arkansas and the tributaries flowing into it at the city of Wichita. As to the evidence tending to show that the Arkansas river above the mouth of the Little Arkansas has become practically a dry stream, I would say there is apparently a progressive desiccation of all rivers
4882 and lakes throughout the arid and semi-arid region, and the disappearance of thousands of small bodies of water in the Dakotas, Nebraska and south in Texas, due, presumably to a small

climatic swing and a more thorough cultivation of the soil, causing the water to sink underground instead of running off the surface.

If the waters of the Smoky Hill and Solomon rivers have not decreased and the depth to which they have had to go to water in those valleys has not increased in the State of Kansas and the depth to which they now have to go in the Arkansas valley in order to find water has increased, I would say that if that is a fact
4883 then there must have been something different on the Arkansas river than on the Smoky Hill and Solomon rivers. (Objection by defendants.) If the level of the underflow in the Arkansas valley has gone down on an average of three to five feet from the western line of the State down to the city of Wichita within the last twelve or fourteen years, I would say that if that water level is and was above the river it was the result of climatic conditions; if it is below the level of the river then it is probably connected with some modifications of the river itself. I should measure it from the low water plane of the river during the summer season. If the summer season were a dry season, then it would be from
4884 the bed of the stream. We would start with the water in the channel of the river as the base and compare the depth of each well with that as a base line, and would compare it in each of those cases with a point in the river on a direct line north and south from that well, as was done by Mr. Johnson, as shown in his testimony. The average fall of the Arkansas river per mile through the State of Kansas is from seven to eight feet. If the water should go from the river above into those wells four miles directly north of Garden City, as to whereabouts it would leave the river in order to reach those wells, I will say it obviously must leave the river at a point which is relatively higher in order to progress toward the wells—at some point which is relatively higher than the bottom of the wells or the point at which it stands. If the evidence shows that the water in those wells at Garden City is practically on the same level as the water in the river, then I should say that the water that would get into those wells four miles north of Garden City must leave the river at one or two or perhaps five miles above the point with which the comparison was made, for instance (objection
4885 by defendants), and the water at the point where it would thus leave the river would be higher than the water in the well, and the water thus leaving the river would be seeking a lower level all the time. That would be true on down the river everywhere.

4886 The measurements which Professor Slichter is making give the direction of the movement of that water, and in our sections, attempted to be made at right angles, the course of the movement is detected by such instruments as we have. If the measurements as a general thing show that the water level back from the stream due north from a point in the stream or due south from a point were level with the water in the river, then as to where that water came from that supplied such test wells, I would say it could

without regard to any other points come from any higher point in any portion of the area (objection by defendants), and possibly might have come from the river above.

4887 The rate of movement of the underflow as determined by rough methods and by Professor Slichter has been from a foot a day up to as high as ten or more feet per day. We have no measurements in our office from which we could give information as to whether the general level of that underflow has gone down, and we have no conclusive data on that. If the evidence shows that

4888 prior to the year 1890 the river was much larger in volume than it is at the present time on the average, with the exception of merely flood seasons, and that the river was one-half to one-third wider than it is at the present time, and that this larger flow of the river has decreased since about 1890, as to the effect that would have upon the underflow, I will say that in my opinion it would not affect the underground waters except in the immediate vicinity of the river. During the floods the ground water would be piled up within reach of the river, say half a mile or a mile, and the tendency during the prevalence of floods is for that water to work outward and completely saturate the underground sands and gravels. If the principal part of the flow of that river during the last ten or twelve years has been withdrawn, yes sir, it would take just that much from the supply of the underflow. The regular flow of the river would tend to reinforce the underflow or ground waters in that immediate vicinity of the river.

In speaking about the river having been a "broken" river from the time our measurements began, these measurements hav-

4889 ing been since the year 1890, I do not pretend to say that it was a broken river before that time, only by inference, from other streams. If during the last eight or ten years the river has been practically dry above the mouth of the Little river, I would assign these two causes (objection by defendants)—first, the unquestionable diversion of the water in Colorado, and, second, the general climatic swing of conditions which has resulted in a less flow in a number of rivers.

I spoke about having projects in hand in western Kansas to apply the reclamation service to pumping up the underflow and supplying the land with it. The project is based upon the assumption

4890 that we always will have an adequate supply of water. The cost of pumping is directly in proportion to the height the water is to be lifted, and if at any time the water is higher than it has been the cost would be that much less. If we had to pump it four feet farther, that would add materially to the cost, yes sir. The deeper the water the more the expense of pumping it would be. (Objection by defendants.) It is presumable there will be

4891 less water in the river as irrigation is developed more completely in Colorado, and I assume that that is true with the ditches in Colorado from Pueblo to the State line as they are, yes sir. The more completely the water is utilized by the use and re-

use in the ditches in Colorado, probably the less amount
4892 will escape into Kansas. I understand it is the object of the present system of ditches in Colorado, and that they were so located, to intercept the flow of the seepage. (Objection by defendants.) I assume that practically all of the seepage water that goes down into the Arkansas river in Kansas or that goes to reinforce the flow of the Arkansas river is the seepage water from the eastern or last ditch down the river. (Objection by defendants.)

4893 The soil along the rivers in the arid region where we have been projecting our irrigation experiments is naturally productive where it can obtain an adequate amount of water for plant life. The aridity of the soil in the valleys in the arid region extends practically to the actual flood plane of the river. The only vegetation is the bordering cottonwoods and willows and a little marsh grass. No sir, I think that the doctrine of riparian rights was never applicable to such a country as the arid region at all, not unless it is defined as being something different from what is ordinarily understood.

Cross-examination on behalf of defendants.

By Mr. DAWSON:

4894 I have visited field parties along the valley of the Arkansas river in eastern Colorado and western Kansas within the last three or four years, and possibly since then, passing through there. My own personally conducting it is a matter of ten years ago. Mr. Willard D. Johnson, principally, and his assistants have been doing the actual work of determ-ing the plane of the ground water in the Arkansas valley and to the south and north of it in eastern Colorado and western Kansas. Mr. E. C. Murphy did a small amount of work there. Mr. Charles S. Slichter is now conducting work, with assistants. I think, irrespective of movements, Mr. Johnson has made the most careful observations as to the flow or the movement of the ground water and has had the best opportunity from actual observations made in the field to determine the plane of the ground water along the Arkansas valley in eastern Colorado and western Kansas, and he is the Mr. Willard D. Johnson who was on the stand here the other day. He was put in charge of that work by me, and
4895 he was chosen because of his qualifications and fitness for that particular work, distinctly so, and because of his knowledge of the country through many years of surveying, and because of his thorough training and ability as an observer.

The word "underflow" I use simply as a popular word which has been applied to ground water particularly in the arid region; but I have in mind simply the occurrence of ground water and its movements towards points of least resistance, and in using that word today it was my intent to simply refer to the ground water and its appearance. So far as I am aware, there is no line of demarcation

between the ground water throughout the plains area and
4896 that occurring in the valley of the Arkansas river. The general course of the movement of the ground water of the Arkansas River valley has been in a rough way coincident with the general course of the valley, so that in sinking wells at right angles with the valley it was the belief, and was subsequently proven by experiments, that these wells were at right angles with the main trend of the movement, and it is true that the experiments carried on under my direction have shown that the general movement of this ground water in the Arkansas valley is with the river and toward the river in a general way. As a rule, it is believed that the ground water augments the river and
that only in times of flood is there any notable contribution
4897 toward the ground water. When the river is in flood it raises the general level and that water percolates outward on a gently decreasing grade to raise the level of the ground water. It would be the general effect that the river in flood time acts as a dam or barrier and backs up the ground water which is proceeding toward the river, yes sir. So long as there is any water flowing in the stream on the surface or so long as the sands immediately beneath the surface are saturated with water it is not probable that the ground water is deriving any supply from the river so long as it is in flood, if the ground water is higher than the river. There are conditions where the ground water is somewhat lower. Those are in rare instances along the Arkansas valley, yes sir. There is believed to be a place in the Arkansas valley where there is seepage away from the valley, as there is on the south side of the South Platte. That is, in the same general direction; that is, that the Arkansas loses out to the south somewhere east of the Colorado-Kansas line is apparently the case. There are rivers or perennial streams heading to the south of both of those rivers that may draw and probably
do draw a small amount of water by diagonal seepage from
4898 those valleys. They lie only a few miles south from the Arkansas river. The rivers flowing south head immediately against the valley of the Arkansas and against the valley of the Platte.

I have driven along many ditches between Pueblo and the Kansas-Colorado line on the Arkansas river, along the river and along the ditches, at occasional intervals within the past four or five years. Most largely, however, within five to ten years; and I visited principally within the last five years in the vicinity of Lamar the large ditch system that was being enlarged or was under construction north and east of Lamar—the Amity system. If it should develop upon investigation that the level of the ground water rises to the south of the Arkansas river just east of the Kansas line, as it rises to the north, that would appear to indicate that it is entirely cut off,
because there is no reason for the water to rise up hill and
4899 flow over the divide.

I have no knowledge of the fact assumed by counsel for

complainant that the Solomon and Smoky Hill rivers had not been diminished in flow in the last fifteen years, only a general impression that there has been a slight diminution in all those streams. My observations and studies in reference to all of the rivers in the arid and semi-arid regions which have been settled up within the last twenty-five years have led me to believe that there apparently has been a somewhat general decrease of the available water supply as shown by the abandonment of water powers and the drying up of lakes and springs which were utilized by the earlier settlers, as compared with the earlier times. The most notable cases I think of are in the Dakotas—North and South Dakota—east of the Missouri river, and I think there are a number of streams in eastern Nebraska where it is reported or generally understood that
the flow has decreased notably, rendering water powers which
4900 before had been used practically useless. And going outside of the arid region, as an observer of rivers, in the Middle and Eastern States I would say that there is a very decided change in the behavior of rivers during the last twenty-five or thirty years, due to the cutting of the forests and possibly to other causes. It is true there has been a very widespread destruction of forests in the mountains of the arid region on the headwaters of streams which head in the mountains, such as the Arkansas, and the effect, my observations have taught me, in a large way has been injurious in increasing the violence of floods and reducing the summer flow, and the apparent tendency is for the snow to go off more rapidly and more violently and the flow of the water is very much shortened.

The cultivation of the soil has a very marked effect on rivers in modifying the amount of water which reaches the rivers immediately after a rain storm. It may soak into the ground and reinforce the underflow or underground waters; but on the contrary the digging of ditches and the construction of roadways may bring the water into the river more rapidly, so that it is hard to generalize
in a large way. The tendency of cultivation is to permit
4901 the rain to soak into the ground. That is the primary object of cultivation, and it thus adds to the amount of water in the ground and prevents it from reaching the river directly. The amount of evaporation from the water sinking into the plowed ground or falling upon the plowed ground depends upon the subsequent cultivation. If the ground is simply plowed and the water falls upon it, there may be a large amount of evaporation. If it is cultivated immediately afterwards and mulched the water is held in the ground, that being the object of the improved methods of cultivation. If a slight rainfall occurs gently it will be soaked into the
plowed ground; if it occurs as a cloudburst it will pass off the
4902 surface, from its very intensity. I have made to a considerable extent a study of the question of the return of waters to streams from the irrigation of large bodies of land, and I have found that there is universally such a thing as return water where any considerable amount of land is irrigated, depending upon the geological structure

and the care with which the water is applied to the fields. In regard to the return waters coming back to the Arkansas river by reason of the irrigation in Colorado, measurements of that character were conducted in coöperation with the State engineer and the results have been published in the reports of the Geological Survey. My recollection at the present time is that there is a return seepage of from twenty-five to thirty per cent. of the water applied. It is true in irrigating in a climate such as you find along the Arkansas river in Colorado that a large amount — water is taken out of the stream at a time when the water is flush and spread upon the lands. Yes, I think that is the case, and when I speak of twenty-five to thirty per cent. returning from the irrigation of lands I do not limit that to twenty-five or thirty per cent. of the flow in the stream at the period of low water, but twenty-five to thirty per cent. of the water actually put upon the soil, and it would return later in
4903 the season; and the withdrawal of the water for irrigation and its application to the soil at a time when the stream is high has a tendency to maintain the flow of the stream lower down later in the season and thus equalize the flow of the stream, yes sir. My recollection of the question asked me by counsel for complainant in regard to taking out water for irrigation in Colorado by the use of those ditches was that the question was coupled with the statement that the return waters were also caught so that practically all of the original water and all of the return water was
4904 taken out in Colorado. If the water was taken out simply at one time in Colorado and the seepage water was allowed to continue down the channel it probably would add to the low water flow in Kansas. My impression is that the return waters from the ditches in Colorado reached the river in a fairly continuous seep throughout its length, particularly where the thick gravel occurs, from Pueblo down to Rocky Ford, depending on the thickness and character of the underlying gravel. No, I have no direct information on the subject of whether some of the return waters reach the river after the river has crossed the Kansas-Colorado line. My personal observations along the river were made some years ago.
4905 Yes, it is a fact that one does not see the full effects of the return flow from irrigation under any large system, until some years after the land has been put under irrigation. Some years must necessarily elapse for the water to saturate the soil.

I did not mean in answer to the question of counsel for complainant in regard to the reclamation act being limited to the upper State in case that State should claim the right to use all of the waters rising within its borders to say that such act could not apply to the waters originating in each State.

There are no projects for building reservoirs in Kansas which we have under consideration. Our plans in Kansas are dependent wholly upon pumping from the ground waters or possibly storage in Beaver county, Oklahoma. In regard to the waters we expect to pump in Kansas, we have assumed that the ground water would be

ample as supplied by rainfall on adjacent areas, and have based our estimates upon the assumption that there would be ample
4906 water irrespective of any diversion above. In using the waters of the streams for irrigation, other things being equal, it is best to use it at an intermediate point where the climate and soil are most favorable for the production of large crops—neither too close to the mountains where the soils are generally heavy gravels nor too far out on the plains where we get high winds and a greater evaporation of water. There is an intermediate point on most every stream which is most advantageous. We take into consideration the loss of water by evaporation as the stream proceeds out onto the plains, and taking a country like that about Lamar, Rocky Ford and Holly in Colorado with reference to the Arkansas river, it is very favorably situated in every way, and it is probable that if the entire river were unutilized any comprehensive scheme would contemplate utilizating the greater part of the flow at Rocky Ford and from there eastward as far as it could be taken advantageously.

I got the impression from my study of the Arkansas river
4907 that it was what might be designated a broken or double river. My impression would be that it fades out or disappears farther east than the place given by Mr. Johnson. I think in his answers he had in mind the western end of the county in which Garden City is situated rather than the State line, and with that assumption I should say the river normally disappears a short distance west of Garden City, and my impressions have been that from Garden City easterly beyond Dodge City and Hutchinson until approaching Wichita it was what might be classed as an intermittent stream. That has been the general condition as I understand it from reading the travellers' and the earlier surveys and examinations. One year it would be reported as a dry stream and another as a fine river, and I have accounted for it in that way—that it was intermittent in character, and it is interpreted by students that that part of the river bears upon its
4908 face the evidence that it is that character of a stream. I think a trained observer, having never seen or heard of the river, ought upon going over this course which I have termed intermittent to draw that conclusion with a good deal of certainty, yes sir. As to the effect upon the flow of the Arkansas river as far down as Wichita and Oklahoma, aside from the use of the flood waters, by the use of water for irrigation in Colorado I think there is undoubtedly some deleterious influence in Kansas; that is to say, the river ceases to flow farther west than it would if there was no water used in Colorado. I think the use of the water in Colorado would have a tendency to affect the stream as far down as Wichita or in Oklahoma and to cause it to cease a little sooner; but as to the degree of the tendency, it would be very difficult to tell, and as to the extent of the influence during the ordinary flow of the stream, I do not think there is enough water gets across that intermittent

strip during the ordinary low stages of the river to have any appreciable effect on the lower part of the river. There is a condition of intermittency that is hard to describe without assuming some arbitrary quantity. If you would say how much water, we could then agree upon the probable effect.

4909 In saying that riparian lands are more profitable to irrigate I would add that it depends wholly on your definition of riparian lands. An assumption is made, as I understand, that riparian land means within three-quarters of a mile from the stream. Now, considering that, then, the better lands are at a little higher elevation and in more compact bodies farther away from the river than the little narrow strip three-quarters of a mile along the river. Yes, it is true that in taking out a large canal you can with very slight additional cost bring under irrigation a very much larger acreage and in that way lessen the cost per acre. I understand that the proper use of "riparian" is simply for a line bordering a river on each side, and that it contemplates that the water shall not be altered in quality or quantity at any place along

4910 that line. Giving the term that meaning, the reclamation act could not be carried out at all with that enforcement, and future development by irrigation, whether under that act or by private enterprise, would be at an end, yes sir. As these improvements necessitate the taking of the water from the river, it would do away with the improvement which has already been made by irrigation, yes sir. The vital and highest need throughout the western two-fifths of the United States is to take all the waters from the rivers and utilize them, consuming them in agriculture, whether the streams are navigable or unnavigable, all waters of any kind. The question of the navigation of streams in the United States has become much less important within the last twenty-five years. Very much.

4911 And the tendency of Congress, as shown by recent legislation, is to give the reclamation service the right to divert waters from the rivers which up to the present time have been considered navigable, such as the Colorado and Yellowstone. Four million dollars have already been expended under the reclamation act and contracts have been entered into for the expenditure of upwards of fifteen million dollars more. The amount coming into the fund under the reclamation act has been from three hundred thousand to five hundred thousand dollars a month, or an average of about six million a year. Yes, that will decrease gradually, I think. There has been an exceptionally rapid disposal of public lands. Of course when the refunding takes place that will be so much more. This act is so drawn that as these various projects are completed they will return the money expended by the Government to the fund, yes, to be used over again without act of Congress.

4914 It is returned without profit or interest.

In referring to the flattening out of the river to which I have testified in answer to counsel for complainant, between the Kansas

State line and Wichita, I will say that I think as a rule the floods flatten out from the headwaters down. I do not recall any cases where we do not get that flattening out, unless it has been reinforced by floods below. It differs in degree, though, as to amount, yes sir. I have measured approximately the flow at Pueblo, about thirty thousand second-feet, not being able to get more than ten thousand second-feet at a lower point. It simply flattened out on the low lands.

4916 I think Great Bend is about at the 99th meridian. That we regard as practically the limit of the humid region; then there is a belt of sub-humid or semi-humid, and then the arid region. As to that semi-arid region lying between those two regions I have given, it is a region which can be gradually improved by irrigation, as well as the arid region, yes sir, very greatly. There are habitual crop losses through prevailing drouths there. And even in a country where you may have fairly certain crops from natural rainfall the production per acre and the diversification of crops raised can be much increased by irrigation, yes sir, it can be if it is habitually practiced, in every village and town in the United States. The tendency of the irrigation of lands is to result in smaller holdings—the sub-division and intensive cultivation of the soil. That is an advantage to any country, yes sir, a very great advantage to the prosperity of the country.

In reference to the meaning of the words "climatic swing" used by me in answer to a question by counsel for Kansas, I would say the climate as a whole is regarded as fixed, but through periods of years—of five, ten, fifteen or twenty years or parts of that—there is for each locality a general increase or diminution in precipitation and temperature, so that it is possible to work out periods of wet and dry weather, of heat and cold, which some observers make co-

4917 incident with sun spots or with various other phenomena, but whether these are connected with external causes or not, it is an actual fact that there is more or less pendulum like swing of climatic conditions, always returning to the average, so that in a range of forty-five or fifty years the average conditions are known, but throughout five or ten years it is impossible to say what is the average climate. Throughout the West in general—and I will include the Arkansas valley in that—there has been a gradual drying through the past ten years which has been very notable in the extreme Southwest and is perhaps less noticed in the central part of the United States.

"Percolating waters" as I use the term are the waters which progress toward the line of least resistance through gravels or sands or other pervious strata. The ground water is percolating water, yes sir. There is no possibility of defining its boundaries except as they

4918 are coincident with lines of gravel or clay. The direction of its flow follows the line of least resistance, which is modified by the descent or the porosity of the material.

Recross-examination on behalf of defendants.

By Mr. ASHBAUGH:

In speaking of the use of water for irrigation as being the highest use of water I did not mean to say that it should be so used to the detriment of individuals or municipal use. As far as it is used for saving and perpetuating human life it would be superior to its use for perpetuating vegetable life. Return waters may be waste
4920 waters if not utilized. With increased demand for water there would be more complete use of it and more economy in that use.

In my reference to the early writers upon the Arkansas river, I presume each writer described it as he found it. We must consider the season of the year as well as the geography of the place.

Yes, the result of taking out water in Colorado has been to extend the dry periods of the year at both ends—it makes it dry earlier in the year and keeps it dry longer in the other part of the year.

Yes, I have been at Wichita, and I recall the bridge and dam at the junction with the Little Arkansas. If the bridge across the Arkansas river in the city of Wichita was built in 1879 and was built upon piles driven down in the bed of the river below the extreme low water mark in coffer dams, and those piles were cut off so as to always remain below the low water mark, and if those piles had never been seen by anybody protruding above the water until about the year 1890, and if the evidence in this case shows that during the greater part of the year, within the last five years, and that during the summer of 1904 especially, as the exhibit in this
4921 case (Exhibit A–41) shows, those piles protrude two feet above the level of the water in the river, as to what my inference from that state of facts would be as to the amount of water that ordinarily flows now in the river in comparison with the amount of water that used to flow when the bridge was built, I will say that two explanations might be offered. (Objection by defendants.) One is the obvious one, that there is less water; the other that the contraction of the water way which is going on in all rivers has resulted in a deeper scour and a general lowering of the water plane of that area. We know that the bridge abutments are forcing in and contracting the western rivers, as shown in the destructive floods at Topeka. The contraction of water ways in towns is a very complicated affair in the behavoir of the scour of the stream.
4922 The coincident decrease in depth and width would indicate a less amount of water or that the floods were less in quantity.

Yes, sir, the Arkansas river has well defined banks, although
4923 the banks are not very high. It would be the natural inference that if the depth is the same and the river banks have been materially narrowed throughout the length of the stream this would indicate a very much less flow of water in the river, normally. (Objection by defendants.) If the river just above the city of Wichita had narrowed within the last thirteen years 627 feet by

actual measurement, and that within the last five years it had narrowed 287 feet, and if there was no bridge, no artificial influencing of the banks at all, it would seem to be the case that the very narrowing of the banks indicated in itself a very much less flow of water in the river. (Objection by defendants.) If the depth had remained the same, I assume that the same depth would have kept the banks back where they originally were. If the facts show
4924 that the narrowing of the banks of the river from Syracuse clear to the city of Wichita to one-half or two-thirds of the original width, the inference follows that the amount of water flowing in the river must have materially decreased. (Objection by defendants.)

If the wells throughout the whole valley of the Arkansas river have invariably lowered within the last fifteen years, I would say that if the level of the water in the wells was above that in the river it would seem to indicate climatic conditions. At or near
4925 the water level of the water in the river I would connect it very closely with the behavior of the water in the stream. If the rise and fall of the water in the wells were entirely dependent upon climatic conditions; that is to say, if there were no local rainfall, excluding the local rainfalls or the lowering temperatures, it would seem they must be connected directly with the river. (Objection by defendants.) If the water in the railroad well at Burrton, Kansas, went down about fifteen years ago so that it had to be dug deeper, and if before that time and after that time the water in that well shows a rise and fall subsubsequently to a corresponding rise and fall in the Arkansas river, I should say, if we can eliminate the artificial cause—the pumping—and the local rainfall and the lowering of the temperature it must be connected very closely with the river. If
4926 the cellars that have been dug in the city of Wichita and other cities, notably Hutchinson, Kinsley, Dodge City and Garden City, when the valley was originally settled along in the '70's, showed that the water level was so near the surface that no substantial cellar could be dug or foundations for building could be built without putting them down into the water, and that for the last fifteen years those cellars that did have water in them have now gone permanently dry, and that it is easy to dig cellars in these cities without striking water or the ordinary water level, as to the inference I should draw as to the underground water level or the underflow having lowered, I would say it would unquestionably show that the water had dimin-
4927 ished. In determining what has caused the falling off of the flow of the river as indicated by the last question, except upon the theory of the taking of the water in Colorado for irrigation purposes, I should say I would want to study all the related questions very carefully. (Objection by defendants.) I think that undoubtedly it is connected, and yet the facts would require a very careful study and verification.

Recross-examination on behalf of defendants.

By Mr. DAWSON:

If it should appear from the evidence in this case that the bridge across the Arkansas river in the city of Wichita, on Douglas Ave., had been narrowed some three hundred feet, that is, the abutments brought that much nearer together since its original construction, and that just below the bridge they had been taking out one or two train loads of sand from day to day for years, then I would say that the fact that the piles stick out of the water would indicate that it might be caused by either increased scouring in the chan-
4928 nel or by less water; but I do not think the facts are sufficient to lead to any definite conclusion. The tendency of narrowing the channel by the building of bridges at other places along the river is to scour out the bed of the river. The narrowing of the banks would result in scouring. I should think the fact that the land is all broken up along the river and that prairie fires are very much less than in the early days, thus allowing little willows and cotton-woods to grow up along the banks, would have a natural tendency to narrow the bed of the stream. Yes sir, I should think it might.

When a bridge is constructed it should be constructed to take care of the ordinary flood flow. The tendency is to construct the
4929 shortest bridge that is safe. In regard to whether or not one could draw any conclusions worthy of consideration from the fact that there was a certain width of stream and a certain depth under a bridge which had been built large enough to take care of the flood flow, I would say that it is necessary to use that in connection with a great many other collateral facts.

In regard to the rise and fall of the water in the wells and its relation to the water in the river adjacent, as based upon the statements of farmers and those who are not trained observers, I would say that as a rule it is absolutely essential to verify statements of the oldest inhabitants by careful measurements. (Objection by complainant.)

As to whether the Arkansas river and its valley show any evidences of having been a larger river at some time in the past, I would say that it depends upon the definition of "past." In geological ages, of course, it has been simply a shifting stream which at various times has traversed a vast extent of plains region.
4930 Its present place is merely accidental and transitory. Yes, the valley of the Arkansas river shows very clearly that the stream has been always or at least for ages a shifting stream, running first in one place and then in another. The entire area is made up of shifting stream channels coming from the mountains. Yes, it might be true that in the immediate valley of the Arkansas river there were old river channels of coarse gravel and sand in which if a well were sunk it might show the effect of the river very readily, though removed some considerable distance.

The gravels which underlie are in long, irregular strings or lenticular masses, so that the position of a well striking one of these lenses of gravel would very materially affect the amount of water it would receive and the source from which it would draw. In regard to the statement that a well sunk in one of those old river channels would show the effect of a rise in the river much quicker and to a much greater degree than another well not sunk in such channel, which might be between that and the river, I would say that the second well might be sunk in a bed of clay, and its behavior—in fact we know that the behavior of adjacent wells is frequently very different. It would be necessary to take into consideration all of the other facts available.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4931 I have not noticed that the bed of the river between Wichita and Hutchinson has been gradually filling up and growing up to willows. If the bed of the river between Wichita and Hutchinson has filled with sand from one to two feet and the sand bars have become solid and are now overgrown with vegetation and finally with willows to such an extent that even in the original bed of the river there are only rivulets and channels, made within the last fifteen years, as to what inference I would draw, I will reply that I infer that there was less water in the river.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

4932 I know in a general way the conditions prevailing in Utah. There has been quite a large and complete development made there along agricultural and horticultural lines by irrigation because of the fact that the rivers issue from the mountains in small volumes and steep sloes and the Mormons have been very successful in their colony enterprises in taking these small streams out and irrigating the adjacent bench lands. Practically all of the property which has been created and exists in Utah, exclusive of mines and city real estate, is dependent upon irrigation. Practically all of the population of Utah is dependent directly or indirectly upon these irrigated lands, outside of the railroad and mining interests.

If the well at Burrton concerning which counsel interrogated me is situated nine miles from the Arkansas river, and if the conditions were the best we know of and a rate of say ten feet per day were established, it would require 4,750 days for the water to percolate at the rate of ten feet per day, or about twelve years, to go from the river to the well. (Objection by complainant.)

4935 FRANCIS E. WARREN, Washington, D. C.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I reside at Cheyenne, Wyoming. I am United States Sen-
4936 ator from that State. I was first elected in 1890, served until March 4, 1893, and came back in 1895 and have been Senator ever since. I went to Wyoming in the spring of 1868 from the State of Massachusetts. While Wyoming was a Territory, and also while a State, I was a member of the legislature, treasurer of the Territory, mayor of the city of Cheyenne, member of the council of that State, governor of the Territory under two different appointments—the last governor of the Territory, and was elected first governor of the State.

When I first went to Wyoming there was no development of any consequence along horticultural and agricultural lines. A few little gardens around old military posts, but nothing else. At that time Wyoming was a part of Dakota and there was but one town in that part of Dakota—Cheyenne. The Union Pacific railroad at
4937 that time was extended no farther than Cheyenne. There has been considerable development along agricultural and horticultural lines since that time. Aside from the railroad and some coal mining, there would have been nothing to cause settlement in Wyoming at the present time without irrigation, and the raising of live stock could not be successfully carried on now without irrigation. I can conceive of scarcely any business that
4938 could exist without irrigation. Even the development of our mines must have irrigation behind it. No, irrigation has not reached its highest development in Wyoming. In irrigation we have with two or three exceptions simply taken out handy places that lie near the streams and onto which water could be conveyed without great expense, but the unused broad benches that are the most valuable, which require longer canals and perhaps expensive dams, are numerous and attractive, and there is water enough, if it is properly husbanded, to bring a great many of those areas in, and aside from the development of Wheatland, which is perhaps the oldest venture, and the development along the smaller areas, the main portion of the highly productive lands that can be irrigated by corporate or Government investment in the way of irrigation works is yet there unutilized. I will say that more than
4939 one-tenth of the area of Wyoming can be irrigated. I should think that this would more than quadruple the number of people. When you come to intensive cultivation five or ten acres is plenty for the support of a family. If intensive farming were practiced, in respect to the land when it is irrigated we can only judge what it would be worth by what land under similar irrigation brings

in other places, such as California, Colorado, Arizona and
4940 New Mexico. It fluctuates a great deal, but they show all the way from twenty-five to a thousand dollars an acre, including the water rights. The land which can be added to the irrigated area is worth very little now. This is best judged by the fact that the Union Pacific Railroad Company has a large quantity on the market at from fifty cents to $1.50 an acre, and it moves very slowly. We could do nothing without irrigation, in the way of agriculture or fruit—nothing at all. We could get nothing except a little grass for grazing;
4941 that is all. If we were compelled to let the water go down the streams unobstructed and unaffected except as it might be used for power or domestic purposes, there could not be any development in agriculture or horticulture. If the irrigated area were limited to lands bordering on the stream, that is, within one-fourth to three-quarters of a mile therefrom, the country would have to remain just as the interior and unused portions of Nevada, Wyoming and other States were and are now. There could be no development.

I took an active interest in what is known as the Wheatland Development Company or the Wyoming Development Company. I was one of the first subscribers and incorporators. Speaking without memoranda and just by guess, I should say it started in the late '70's, the initial proceedings, and went along I should say through the '80's, which was the most active period. This enterprise is situated about ninety miles, by railroad, northwest of Cheyenne, in Laramie county, Wyoming. The company takes the waters that irrigate the lands from the Laramie river, which has its rise in Colo-
4942 rado. If the people in Colorado should persist and succeed in taking all the waters of that stream beyond the Colorado-Wyoming line, in my opinion it would cause a shrinkage there of the irrigated area and a moving away of the population down to the point where the irrigation could be carried on from the remaining waters that come into the stream over the Colorado line. (Objection by defendants.) It would take the majority of the people, in my judgment, away from there and would cause an abandonment of a large portion of the land under that enterprise. In regard to the number of people that are now supported directly and indirectly by that enterprise, I will say there is somewhere, in the town of Wheatland or in and around Wheatland, between 3,500 and 5,000 people. I think I am very conservative in that statement.

I was in Congress when the act known as the reclamation act was passed. I was a member of the committee of seventeen that
4943 adopted and reported that act. I was chairman of that committee. I am reasonably familiar with it and had a good deal to do with clearing the way for its passage. By its terms it applies to the whole arid region. If the waters in the streams of Wyoming should be allowed to flow unaffected and unobstructed it would render the operation of that act in Wyoming practically nugatory. If the irrigated area should be confined to the lands

within half or three quarters of a mile of the different streams, in my judgment it would render the act altogether impracticable
4944 because the act now rests upon this plan.

I have been over the whole arid region more or less. In a general way, the physical conditions which exist in Wyoming prevail generally throughout what is known as the arid region. Of course there is an individuality to each State and locality, but in a general way the conditions are much the same.

4945 Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

As to the effect upon the reclamation act and the reclaiming of arid lands under it if the upper State had the right to own and control all of the water that fell within its borders and if it did actually take and apply to irrigation within its borders all the water that fell within that State, I will answer, first, that the act of Congress does not provide that, because the act is one recognizing priority of rights and the expectation is that the State below may go into the State above and take out the water if it is a matter of prior entry and application. (Objection by defendants.) Now, the effect of taking the water all out in a higher State and using it there in irrigation—first, that is one sense impossible, in my judgment; that is, it is impossible to exhaust the stream so that it remains entirely dry by using water for irrigation, because, allowing a certain percentage for evaporation, water so used finds its way back into the stream and flows on down. That portion of the water that is taken over the divide and used in another water shed, the portion not evaporated, of course finds its way into the natural drainage
4946 of that water shed. Anything that interferes with priority of rights to the use of the water, that is, with the first ownership, and with the usefulness afterwards, impairs the law. There would be an impaired usefulness of it. (Objection by defendants.) Such a use of the water of interstate streams in the upper State as you spoke of would be sure to contract it in the lower State.
4947 (Objection by defendants.) Priority of use of the waters of inter-state streams is clearly one of the essentials of the rec-
4949 lamation act. (Objection by defendants.) Now, I will answer that I do not know what the pretensions of Colorado are or what the issues are in the present case that you are asking me to give judgment upon. I say generally that the reclamation act in order to be successful must jealously guard the right of priority in the use of water regardless of State lines, and that priority and use must be clearly defined as to priority and must rest upon a continual use for irrigation. If that doctrine should be applied as between Colorado and Wyoming and the water should be diverted in Colorado, I will say it would in a great measure deprive
4950 us in Wyoming of it, of course. It would contract its general usefulness, yes, sir. (Objection by defendants.) As to

the condition of our valley lands lying along our rivers in Wyoming prior to the time when there was any irrigation, as to their producing any natural vegetation to any extent whatever, I will answer that the very lowest lying lands where the grass could be watered from the natural flow would produce good grass and a crop of hay, but the land lying across the stream where the bank comes down more sharply bore nothing. Where a little meadow existed, enough to raise a little grass for cows and a horse, the back country gave a wide range and therefore without a stream they would have been without water for domestic use. The aridity of our lands
4951 prior to irrigation extended generally right to the stream.

Cross-examination on behalf of defendants.

By Mr. HAYT:

It is the tendency in most every locality to make the sub-divisions smaller and smaller by the irrigation of land. Most crops
4952 produced through irrigation are very superior to those produced otherwise. For instance, in the crop of oats, where thirty-two pounds is the accepted legal weight of a measured bushel, in an irrigated country they will go from forty pounds upward. The same is true of wheat; and you can raise finer potatoes with irrigation than I have ever seen raised without. I don't think apples can be raised on irrigated land to have that solid worth and weight that they will have on some of the rocky portions of Massachusetts, but nearly all of the grains and vegetables are not
4953 only larger in yield but more weight to a given measure. The distance that the Laramie river runs in Colorado would be small as compared with the distance running in Wyoming. The Laramie has tributaries that rise within the State of Wyoming, some I think, but the snow that feeds this stream comes quite largely from Colorado, but the great drainage is within the State of Wyoming. The part of the Laramie river that lies in Colorado is largely the rougher, snowy portion of the mountains. I do not know that I should say from my experience that it was impossible for the upper State to drain a stream of all its water, but I do say that it is nearly impossible and impracticable in taking the water out of any given stream, unless it is taken over a divide so that it goes into another stream bottom, to prevent some portion of it from getting back
4954 to the stream lower down. In other words, we are never afraid but what we shall have enough in the stream for domestic purposes and the watering of stock and all of that below where there is plenty of irrigation. We may not have a large volume to bring out and fill a big irrigation ditch, but we always have water for all the smaller purposes, for the land lying along the stream. Oh, yes, wherever water is used for irrigation, if not taken beyond the drainage of the stream, there is more or less seepage or return water back to the stream which at all times would be sufficient to supply more or less water to the stream. But you must understand,

though, we are now speaking of the Laramie river. You can go to the Laramie river near its head and by tunnelling through you can turn the water so that instead of its going to the North Platte and making that great detour and coming down into the Missouri, it would go in the other direction, into the South Platte or some other stream and not find the water from which it was taken for many hundreds of miles.

4955 As a general proposition, the amount that gets back in seepage water increases with the amount of land under irrigation and the amount of water used to irrigate such lands, of course. As a general proposition, it is more economical to use the water near the source of supply, but that only prevails to the extent of the evaporation and seepage when it is being conducted, and it depends on how it is conducted. If it is spread over a great deal of surface, a great deal of water is consumed there rather than going below. Of course, if there is a large channel made the bottom becomes well puddled, there is a good fall and it moves along rapidly and it is subject then to but little loss.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

4956 We considered that the passage of the reclamation act was almost life and death with us, industrially speaking. We considered that our growth to any considerable pretensions rested upon it or upon a sufficient lapse of time so that private capital could be enlisted and expended, and this last would naturally—requiring the many millions of dollars it does—carry it beyond the present generation or present life of the men who have made these States, and who are now engaged in building them up. This was also the judgment of the other numbers of that committee of seventeen. They were representative men from the different States and Territories constituting what is known as the arid West. This whole reclamation plan rests upon the best utilization of all the water that falls in snow or rain, not only confining it to the mountains and using it in the States nearest, but along the entire line or until it reached the ocean, in the first place, the holding back of storm waters and thus preventing floods in the lower country, and second in reinforcing the streams when they are low, because when the streams are low is the time when you are using the most for irrigation, and naturally the seepage which I have described takes place. Take a stream, for instance, that is now irrigating 50,000 acres; we take the water for irrigation about two months in the year, that is all, the balance flows on by and does damage in times of floods instead of good. We felt that we could take it all times of the year, hold it back in reservoirs, and let down such amounts as are needed at all times for domestic purposes and for irrigation; thus a year's supply of water for two months' use greatly multiplies the irrigable acreage. We do

not use one-tenth of the water that we could use if we would
4957 make dams and catch basins enough so that we could take all of the flow above the place where we have the dam; the stream below being reinforced all the time by the small streams flowing into it, and we could hold this water back and commence letting it down as soon as the water is low in summer, or as soon as it is needed for the irrigation of this vast country, in the meantime reinforcing the stream. Worked out to its conception, worked out to the ideas that this committee of seventeen and the men behind them in all those States had in mind and believed in and desired to accomplish, it meant more water in usefulness for every State, high or low. It was prior rights for irrigation we considered would always be respected.

4958 I consider irrigation, of course, the paramount use of water in the arid region. I was raised in Massachusetts, and brought up on a farm. I have been thirty-seven years in the arid region. All but two of those years I have been interested in agriculture more or less, stock raising, etc., and the tremendous development and results per acre on the small irrigated tracts in the new country called my attention to it and interested me so much that the subject of irrigation and the reclamation of arid lands has been uppermost in my mind ever since, and in figuring conservatively and fairly as a business man, I made up my mind some years since, and it grows stronger on me every day, that some method similar to the national reclamation act, by which all of the water could be impounded and utilized, would bring about the solution or commence the solution of the greatest economic problem before the American people. I believe the results will be larger than the results of any economic problem we have solved or had under consideration, or have conceived of as being of an impending nature in this
4959 country. It is a matter of making something out of nothing, in this way—that it is taking that which nature provides in the atmosphere and which falls to the ground, which we do not have to dig for as we do for mines, and applying it to the land already smooth and ready for the plow, and not only making two blades of grass grow where one grew before, which the wise men said was a sufficient result in man's life to entitle him to some other place than the lower regions, but it brings an almost new country; it brings forests, it brings orchards, it brings fields and homes where all was naked before. There was no intention on the part of those who conceived this law, and, in my judgment, of those who gave their adherence to it, to make it other than equitable and to have it apply as matters of land and water have heretofore applied.

4961 WILLIAM L. SIBERT, Washington, D. C.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I am a major in a Corps of Engineers in the United States Army. I am a graduate of West Point, in the class of 1884. I am stationed at Pittsburg, Pennsylvania, at the present time, in charge of the river and harbor district known as the Pittsburg district. I was stationed at Little Rock, Arkansas, from 1894 to 1898, as engineer in charge of the district known as the Little Rock district, comprising the Arkansas, White and other rivers in that section,—the improvement of them.

4962 In the discharge of my duties it was necessary in the formation of plans for the improvement of that stream to ascertain as nearly as possible the low and high water discharges, and, generally speaking, all of the physical conditions that would affect navigation. When I was at Little Rock navigation extended from some point above Fort Smith to the mouth. This point above Fort Smith was below Fort Gibson. That is, the small boats out of Fort Smith during the cotton season went up the Arkansas river to get freight. Just how far they went I do not know, but they

4963 did not go any farther than Fort Gibson if they went that far.

I never was along the Arkansas river in Colorado except on a railroad train. I never made any special study of that river in Colorado. I did make a study or observation with respect to the effect that irrigation along the Arkansas river in Colorado and in Kansas had upon navigation where I was stationed. My deductions with respect to the observations and examinations I made were that I could not establish the fact from the records and history and any data that I could obtain that the low water discharge of the Arkansas river was decreased in consequence of the irrigation. No new facts have come to my knowledge since I was there. I

4964 have not investigated the question in any way since that time, nor thought of it. From my observation, the stages of the Arkansas river in its navigable portion are determined by the rainfall—that is, almost entirely determined by the rainfall—from points in Kansas down to the mouth of the stream. I do not know just the upper limits of that water shed, but whatever it may be. I did make a report with respect to the effect of irrigation upon the upper regions of the Arkansas river. It was made to the Chief Engineers of the United States Army, and its ultimate destination was the Secretary of War. It was made in response to a letter written to the Secretary of War by one J. T. Smith of Bentley, Kansas, and by the Secretary of War transmitted to me through the engi-

4965 neering department. It was concerning the "underflow," as they styled it, of the Arkansas river and its effect upon the

productiveness of the ground, and incidentally the effect on the low water flow of the river. The Secretary of War referred it to me especially as to one point—as to its effect on navigation. The date of that letter is January 12, 1898. In reply to that I made a report on April 21, 1898, directed to the Chief of Engineers. I have that report with me, and the file number of the same is "$\frac{24}{187}$ engineering department file 1898." I borrowed it personally this morning from the official files and am obliged to return it, otherwise I would have no objection to leaving it with counsel for Colorado for examination.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4966 As to what information I have concerning the flow of the Arkansas river through Kansas, Oklahoma and the Indian Territory, and the State of Arkansas since I left my station at Little Rock, I will say that I have none. (Objection by defendants.) I do not know that I could name all the streams that flow as tributaries into the Arkansas river between the Little Arkansas at Wichita and the city of Fort Smith. That is a matter of geography, and you could get that information from a map better than from me.

As to the proportion of the waters of the Arkansas river at the normal or average flow of the stream as it passes the city of Fort Smith which comes from the Arkansas river above the city of Wichita, I will say an exceedingly small proportion when the river is at its ordinary flow, and when it is at its extremely low water stage, very little, if any. When the river was at a low water stage

4967 there was no practicable navigation on the Arkansas river above the city of Fort Smith. It was navigable only at times when rainfall had produced a stage of two or three or more feet above the low water. Ordinarily, the head of navigation was considered to be Fort Gibson. Insofar as I know, the conditions now as to the river being navigable above Fort Gibson are as they were at the time mentioned in my previous answer. As to how far above the city of Fort Smith the Arkansas river is now navigable during the normal or average flow of the river unaffected by floods, I will say is you call any rise in the river at all a flood, that reduces the time concerning which I am to answer down to low water. That makes the thing indefinite. It is not navigable at all above Fort Smith, Arkansas, at low water, so far as I know, for boats of sufficient size to economically transact business. Generally speaking, the navigable conditions of the river do not vary much between Fort Smith and Fort Gibson. I cannot tell you how far apart they are.

As to the matters of appropriations made by Congress for the improvement of the Arkansas river between Fort Smith and Wichita in the early '80's, I will say that is all a matter of record, and the greater portion of it was not during the time I was stationed there.

I cannot answer the question fully, and it can be obtained
4968 from the official records of the Government—the engineering department. I had nothing whatever to do with the improvement of the river under congressional appropriations at any point in the State of Kansas. I had better modify that statement. Our adopted project was for improving the Arkansas river from some point in Kansas to its mouth, but no actual work of improvement was done in the State of Kansas while I was in charge of the district.

Cross-examination on behalf of defendants.

By Mr. DAWSON:

In referring to the report made by me bearing upon the Arkansas river, I would say that in making that report I could not establish the fact that there had been any diminution of the flow in consequence of irrigation.

Q. Well, if you could not establish the fact that there had been any diminution of the flow, the negative of the proposition was, so far as your investigations established, was it not, that the river
4968 was as good for navigation when you were there as it had been in the earlier times, say between the '60's and '70's?

A. Well, that would be the conclusion I would draw, although I could not establish that definitely by proof.

Q. You saw nothing, however, to lead you to believe that was not true?

A. No, sir.

I did not discover anything in regard to the flow of the Arkansas river west of the Colorado-Kansas line that would materially affect the navigability of that portion of the stream that we considered navigable.

4970 Q. Is there any considerable amount of navigation on the Arkansas, or was there during the time you were stationed there as high up as Fort Gibson?

A. No.

In regard to the commerce carried on by navigation up as high as Fort Gibson of which I spoke before, I will simply say this, that each large town, like Fort Smith or Little Rock, during the cotton season, that is, the time when the cotton is being marketed, when there is a stage of water sufficient in that stream for navigation there are ordinarily two or three little boats centering at that town that go up and down the river carrying this cotton. That is ordi-
4971 narily the extent of the navigation on the Arkansas river. Of course there is also some transportation of supplies and the picking up of other little freights. From Memphis to Pine Bluff on the lower part of the Arkansas river it might maintain a regular line of boats the year round. That was the condition when I was there.

Q. In any investigations you carried on you never discovered

anything that indicated that the use of water from the Arkansas river in Colorado had any effect upon the Arkansas river below Little Rock, did you—from Little Rock down?

A. No, sir, I did not.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

"Average or normal flow" is a term we never use in our investigations. We are concerned ordinarily with "low water" or
4972 "high water," or specific, definite stages. More than half the year was a period of low water when I was there. At this period there was practically no navigation from Fort Gibson down to Little Rock. From my investigation and reading of historical records and from observations there my conclusion was that the low water stage is no less now than it was prior to the time when they began to irrigate the lands in Colorado from the waters of the Arkansas river. I could not establish the fact that it was any less. When I left Little Rock my duties were transferred to Major Newcomer, with station at Memphis. Major Fitch is there at Little Rock now. I guess he has been there about two or three years.

4973 I had a man in my employ by the name of Van Frank. He was there when I went there and has been there ever since. Mr. Van Frank and I together made this investigation that I spoke of. I regard him as a very competent man. He is a civil engineer by profession.

LITTLE ROCK, ARKANSAS, March 14, 1905.

4974 L. P. DRAKE, Little Rock, Arkansas.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I am sixty years of age, and reside at Little Rock, Arkansas. I have been at Little Rock off and on since 1855. I have been living permanently here about thirty years. I have done a good
4975 deal of boating on the Arkansas river. I began first in 1855 and have been engaged in it as late as five or six or seven years ago. I have been as high as Fort Gibson in the Indian Territory with boats. I have observed the flow of the river in high and low water seasons during the time I was boating. I don't think there is any less water in the Arkansas river at the present time than there was years ago when I first began boating. I think the volume of water is about the same.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4976 I never went above Fort Gibson. I think Fort Gibson is about 150 miles from Fort Smith. No, the river was not navigable at all times of the year between Fort Smith and Fort Gibson. It was not navigable generally in the summer and sometimes in the fall. We were in the habit of using on the river small boats, stern wheel boats, propelled by steam. That was the kind of boat that we went up the river to Fort Gibson with, yes, sir. (Objection by defendants.) I don't know how many times I ever went up to Fort Gibson with these boats, but say fifty times, and that was extended through twenty years, and on an average two or three times a year. Sometimes I went up more than two or three times.

4977 I never had any trouble in navigating the river up as far as Fort Gibson. (Objection by defendants.) I cannot tell how wide the river was there; I have not been there for ten or fifteen years. I don't know anything about it. The times that I navigated the river up to Fort Gibson were all more than fifteen years ago. No, sir, I am not prepared to say whether the river at Fort Gibson during the last fifteen years is as large as it wa s prior to that time, and as a matter of fact I don't know whether the river at Fort Gibson is now as high as it was twenty or thirty years ago. I have no personal knowledge of it whatever, none in the world.

Cross-examination on behalf of defendants.

4978 By Mr. DAWSON:

I am most familiar during the last fifteen or twenty years with the river from Little Rock below to Pine Bluff, at the mouth of the river. When I quit the river four or five or six years ago I did not see any difference in the flow of the water within the last few years as compared with what it was formerly, and I have lived in Little Rock for the last five or six years but I have not been about the river for four or five years but two or three times.

Q. Have you had it called to your attention or have you learned anything that would lead you to believe that the river was less here during the last four or five years than it used to be?

A. No, not that I know of.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

4979 I have never seen the river go dry from here down as far as Pine Bluff. (Objection by defendants.) But it very often gets so that we cannot navigate it. (Objection by defendants.)

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

Yes, sir, ever since I have been here the river at times was not navigable from here down to the mouth. I have seen it so low here that there has not been a boat in for two or three years.

4980 EDWIN HUSTON, Little Rock, Arkansas.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I am sixty-five years of age, and reside at Little Rock, Arkansas. I have resided here about forty years. Sometimes I have been away for six months or a year or so. At one time I was engaged in boating—keel and steam-boating. At the present time I am engaged in steam-boating on the Arkansas river. I have been engaged in that business since 1855 between the mouth of the Arkan-
4981 sas river and Fort Gibson. (Objection by defendants.) When I first came here Fort Gibson was considered to be the head of navigation. I was at Fort Gibson in a snag boat about ten years ago, and then I was there on a freight boat about five years ago. I have observed the flow and volume of the river ever since I have been acquainted with it.

In regard to whether there is any less water in the Arkansas river now between the mouth of the river and Fort Gibson, I will have to explain a little about that. The Arkansas river, with my experience on it, there are odd years, probably for five or ten years it might be very bad, and then the next five or ten years it might be very good. But the river is just exactly, as near as I can tell, except in certain places it is changed about, as when I came here. Just the
4982 same exactly. There is one extreme—one way or the other—but as far as the river and the channel of the river, it is just exactly the same. Yes, there are times through a year or series of years when there is less water than the year before. There is an extreme average of about five years. I think the river would be navigable now just the same as before the war, but the business don't justify it, and they haven't got the boats to navigate it. Yes, if the conditions were the same as they were when I first came here it would pay just the same to navigate it now as it did then, and they would not have any more difficulty in navigating it. If they could get paid for the same goods to-day as formerly we could still navigate it profitably, but the competition and railroad rates competing on both sides has caused no business and nobody attempts it. I believe boats do run up as far as Fort Gibson at the
4983 present time. They had been when I went up there five or six years ago. It may now be cut off; I don't know. I have seen years here before the war there wasn't a boat came to the

landing for nine months. I haven't seen it since the war but what there has been some kind of a craft in the way of a steamboat. There appears to be more drouth down in this lower end of the river than there was before the war. The planters complain more of it. But it has not diminished the flow of the river any.

I have heard the expression "the June rise." We still have the June rise in the river. This rise gets its supply from the spring rains. As to whether or not any of the June rise came from the snow in the mountains of Colorado, I will explain that. (Ob-
4984 jection by complainant.) In 1858 the man that I learned the river under—the people contended down here that it came from the snow—the overflow—and some from the water. He went up there personally and experienced it and watched it and came back and reported that it came from the spring rains. That is all I know about it. He was a very reliable man, and that is what he discovered, that it didn't come from the snow. He said it came principally from the spring floods. (Motion by complainant.) This is all hearsay with me. He went up and explored that. The gentleman who made this report is not now living.

4985 Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

No, sir, the river never goes dry in these later years between Little Rock and Pine Bluff. There are times in the year, sometimes, when you can't navigate it. I expect about half of the time between here and Pine Bluff the river is not navigable. Ever since the war it has been in about that condition, that about six months of the year it is not navigable between here and Pine Bluff. In those early days they did navigate it longer, on account of the boats. They had different boats that they could navigate it with.

Q. With the same boats, however, could they navigate it as many months of the year now as they could during the early years that you knew it?

A. Do you mean, to take the same boats they could navigate it as well as they did before the war?

4986 Q. Yes, that is what I mean.

A. Well, they could not.

Q. They could not?

A. No, sir; the boats are different boats.

Mr. CAMPBELL: He says, taking the same boats they had before the war, could they navigate the same.

The WITNESS: Yes, they could navigate the same.

Q. Could they navigate it as long each year with the same kind of boats that you then used as you could in those years?

A. Yes, sir.

I could not tell what the flow of the river is here. The river from the mouht to here is narrower than it is from here to Fort Smith. I

don't know how wide it is at Little Rock. When I first came here it was a third less right here. No, it is not wider now than it used to be here, to take the general average of it. No, sir, it is not narrower than it used to be; it is just the same. As to how deep it is on an average, well, we never averaged it. I couldn't answer
4987 that question at all. I can't answer as to how deep it is on an average excluding floods. During periods of low water I don't know anything about how deep the river is on an average at Little Rock. I don't know anything about the average of these pools. Now, sometimes from here to Fort Smith a bad bar will be right where it was deep, probably eight or ten feet, the year before. There will be eighteen inches of a flow over that bar where there was six or eight feet the year before. Whenever we started out here in low water we would generally find that all the way to Fort Smith there was from three to five bars, you might say, and where we would find a bar that year it probably was not within fifty miles of where we found it the year before. There is no bar here at Little Rock. Nobody pays any attention to the depth of the water at Little Rock. They pay their attention to the bars. I didn't pay any attention to this river in front of Little Rock at all. That is
4987½ impossible to do. Because I knew there was water enough for a boat to go. There is a shallow river here at Little Rock. I have known it to be down at some seasons to ten inches. (Objection by defendants.) Some of it as low as eight inches to two feet, etc. Now, one of those years might be five feet the year round, and it might be thirty inches or three feet the year round; then the next five years it might be a continuous flow of water of
4988 eighteen to twenty inches. I would not say that the river averaged during the dry season three feet.

The first big stream of importance between Little Rock and Fort Gibson is the Porteau; then there is the Cache creek, the San Boy, the Sallasaw and the Canadian river. These all flow in below Fort Gibson. These streams do not all flow the year round; that
4988½ is, not to amount to anything. They get dry sometimes. The grand river flows all the year round. The Canadian does not flow all the year round to amount to anything. I was
4989 up to Fort Gibson about five years ago. I think I have been up to Fort Gibson during the last ten years only two or three times. I don't know what proportion of the river as it flows past Little Rock is supplied by the river as it goes through Kansas. The big spring rises come from above Fort Gibson, and they come regularly in these later years—as regularly as they used to. I couldn't tell how many streams rise in Kansas and flow into the Ar-
4990 kansas. I am not posted on that. The Grand river rises up in Missouri and flows into the Arkansas river at Fort Gibson. I think the Grand river has maintained its usual flow during the later years just the same. I was never on the Verdigris river and don't know anything about the Walnut nor the Ninnescah nor the Little Arkansas. I know nothing about the Arkansas except three

miles above the mouth of the Grand at Fort Gibson. That is as far up the Arkansas river as I ever saw it. From my own experience I don't know anything about whether the Arkansas above the mouth of the Grand is as large now as it used to be.

Recross-examination on behalf of defendants.

By Mr. DAWSON:

4991 When I first began to run on the Arkansas river there was not a railroad in this part of the country and the means of transportation for freight were confined to carrying it in boats or else hauling it overland, and the river furnished the cheaper method of transportation. The amount of boating on the river in late years has fallen off ninety per cent.; and that is not on account of
4992 any change in the river between Fort Gibson and its mouth. It is the competition of the railroads on both sides of the river that don't justify the people to navigate it. The steamboats that we used to run on the river in the early days drew
4994 from nine to twelve and a half inches, and the keel boats drew only three inches. With the same character of boats to-day as we had before the war, the same navigation could be carried on along the river, and the reason that they cannot now run up to Fort Gibson as easily is that they don't run a boat as well adapted for it. They have not got the boats. The simple reason is that the railroads have run them out of the business. The navigation on the stream is limited by the depth of the water on the bars or in the shallowest places, and those places change
4995 and shift from month to month. And that has always been true. The channel of the river occupied by the flowing water here at Little Rock in the last forty years is wider than it used to be. This has no effect at all except in the overflow immediately at this place, because it is wider. In 1866 I think we had that overflow. I have a mark down here. It went into the side door of that old warehouse, and it didn't go there this last overflow by eighteen inches or two feet. Well, now, eighteen miles down the river, mind you, this water overflowed in 1844. It overflowed more down below than it did in the earlier flood, because the river widened out here, and where the water used to come in here in 1866 this bank has been cut away and it has reduced the flow of the water here, and where they had this low overflow here in 1844 it raised it higher there because the river is narrowed up there. In other words, the river widened in some
4996 places and narrowed in others, but you can take an average from here to Fort Gibson, and to me, I can't see a bit of difference in the width or depth or flow of the river. I think we had the longest period of low water in 1861. I don't think there has been any year in the last fifteen years that equalled 1861 in
4997 the lowness of the water and the length of time it lasted. When I got down to the month of the Grand river on the

Arkansas in 1858 there was no water coming down the Arkansas river. It was dusty. I saw cattle walking right over it. It was perfectly dry. It was so low I couldn't get only a few miles below the mouth of the Grand, which was right at Gibson, with a dugout, and I had to abandon it and get a horse and go the rest of the way with a horse.

4998 DAVID D. CHAPMAN, Little Rock, Arkansas.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I live in Argenta, which is right across the river from Little Rock. I am sixty-six years of age. I have resided in Little Rock and vicinity for forty years. I was engaged in plying the Arkansas river as a boatman for about forty years. I ceased doing so about seven years ago.

4999 I remember a boat called the "Aunt Sally." Yes, sir, it took a trip to Arkansas City, Kansas. I was captain of that boat. The inducement that was offered me to take that boat to Arkansas City was, there was said to be $700 for the first boat that would make the trip, so taking this boat I went there to get that, and it was a kind of experiment. I didn't get the money.

5000 Yes sir, I had some little difficulty in getting back. We were fifteen days going up there from Little Rock and twelve days, about, in getting back. Fort Gibson was considered the head of navigation when I first began to ply the river. (Objection by defendants.) I would not consider the river navigable above Fort Gibson. (Objection by defendants.) In those

5001 early days stern-wheel boats were used. They do not use the same character of boats now that we had forty years ago. It is a different class of boats entirely. No, sir, I don't think we could navigate the river to the same extent and in the same seasons of the year now as we did when I first began if we used the same kind of boats, because the river is not as deep now as it was when I first commenced steamboating, I don't think. I mean it has spread out over more ground, yes, sir. (Objection by defendants.) If the water were confined to the same width as it was, then I don't know but what it would be just about the same. Of course we had

5002 some difficulties then, and we have now, and there is a different class of boats now from what there was then. Of course we have had forty years of experience, or I have, steamboating. If I was going to build a boat I should not build one like they built forty years ago, because the one they built then would draw three feet light. The boat I would construct now would draw twelve inches. A boat down here now can carry twelve to fourteen hundred bales of cotton and it only takes sixteen inches of water light, where the same class of boat of the same size forty years ago would draw three and a half feet without a pound of freight in it.

You can load that boat down now and she will carry 1200 bales of cotton on the same amount of water that a boat forty years ago would have floated on light. There is the difference.

Q. If you would use the same kind of boats now as then and the water were confined to the same channel, would you have any more difficulty now in navigating than you would then?

A. I don't know as you would, if it was confined to the same width.

I built the first house that was ever built in Argenta, where I am now living, in 1864. From this "point of rocks" that is named Little Rock now I have stood there when I was a young man
5003 and throwed a rock across the river. Now if I had four throws I couldn't do it. Where I owned property in Argenta it is two hundred yards now—fully two hundred yards—out in the river. There has been two blocks—that is over two hundred yards—over two blocks—caved in the river. The river is three times as wide as when I first came here in 1856. This condition prevails all the way along the river. Well, when I first came here in 1856 of course there were no settlements. There was very little land cleared up right immediately on the river. It was all timber, and you know where it is timber the roots and one thing or another keep the banks from cleaving, and when you cut that timber off and clear it off it just naturally caves. Well, this river caves from both sides.

Q. Now, taking into consideration the difference in the construction of boats now and those in the early days and the necessity for using these modern boats, state whether or not in your judgment the Arkansas river can be made navigable in and around Little Rock and Fort Smith and Fort Gibson.

5004 A. Yes, I believe it could with the boats they have now or that could be built now.

Yes, to confine the water in the channel so that you could navigate it would require the expenditure of a vast sum of money. In my judgement it would not justify the expenditure of that money to make it navigable with these modern boats, no, sir. (Objection by defendants.)

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

5005 It was in 1878 I went up the river as captain of the "Aunt Sally." We started from Little Rock. We were fifteen days in going up, but we only ran in the day time and would lay up over night. The boat had steam power equal to about 20 horse-power, and drew sixteen inches of water. We were only about eight days on the back trip. Coming down, we went with the current. It all depends on the difference in the current. We met two or three pretty good rises on the way up, making a pretty heavy

current. Yes, there was surplus water in the river when we
5006 went up. There was less water in the river coming down than when we went up. We were at Arkansas City about four days. We gave excursions on the Fourth of July and had a good ride around the country looking at it.

I recognize Complainant's Exhibit A–6 as a picture of the "Aunt Sally" taken on the Fourth of July, 1878, at Arkansas City. I was right in the pilot house when that was taken, with a band of music on top. There were three hundred and sixty-five persons on the boat at that time. I collected that many fares; I don't know
5007 how many got away. That boat drew two feet of water when loaded. (Objection by defendants.) We had no load coming down. The reason was the river was falling very fast and I knew enough about the Arkansas river to know that if I didn't get out then I wouldn't get out, and I had my boat up there and wanted to get away. We were offered to have a load given us if we would carry it out, but I didn't want it. I wouldn't take it. Of course we didn't get any of this money they offered as a bonus for the first boat that came there, and I felt mighty sore over it and I didn't want anything. I wouldn't let them put a bushel of wheat on the boat for anything. I was Irish, and am still Irish, and I wouldn't let them put a bushel of wheat on there for anything. The railroad was not into Arkansas City then; it was at Wichita. It had not got down to Winfield. I think this was a scheme to get this boat up there to have it done and that it had something to do with the bring-
5008 ing of the road there. We went up the Walnut river seven miles.

5010 I never went up the river as far as Fort Gibson again. That was my only trip. That was all my experience. I couldn't state what rivers flow into the Arkansas river between Fort Gibson and Arkansas City. I am not a pilot any farther up than Fort Smith, but I have been, though, to Fort Gibson.

I couldn't answer what rivers rise in Kansas and flow into
5011 the Arkansas between Fort Gibson and Wichita. I don't know anything about the Neoshe river. The Walnut flows in at Arkansas City. As to how much water there was in the Arkansas river at the junction of the Arkansas and the Walnut when I was there in July 1878, well, sir, I didn't take any soundings, but I judge there was five or six feet. The river was up at that time. It took several days for it to go down. All the streams I spoke of between Little Rock and Arkansas City were perennial streams. I should think that there would be fully two-thirds of the flow of the Arkansas river as it flows past Little Rock comes from all those streams below the mouth of the Walnut river at
5012 Arkansas City. The Arkansas river at Little Rock is fully five hundred yards wide, and at medium low water would be thirty inches on the average. There are places here where it is ten, fifteen or twenty feet deep, and there are places near Little Rock where the river during medium low water is thirty feet deep. The Grand

river is half the size of the Arkansas, fully, if not a little
5013 more. It is the biggest river there is above here. I think about half of the flow of the Arkansas river below the mouth of the Grand comes from the Grand river. The Porteau is about as large as the Grand. The Canadian is a clear stream. I never saw it when it was muddy, and every time I was there there was about three feet of water in it on the average and it was two hundred and fifty or three hundred feet wide, perhaps a little wider.

As to the effect upon the Arkansas river if all the water that flows in it above the city of Wichita should be taken out, well, sir, I think it would have a perceptible effect here at Little Rock. (Ob-
5014 jection by defendants.) Of course to take that water away, it would be a detriment. Of course that is only just about half the length of the river; that is, from Wichita to its source; and to take that water, undoubtedly it would cripple the balance. It does its part, whatever that might be. No, sir, I don't think that if you should take all of the water that might naturally flow in the river above Wichita it would not make a perceptible difference in the flow of the river at Little Rock. (Objection by defendants.) I think it would make a difference, and a very great difference, because there are several streams coming in. Of course I don't know that. I never was up there. Now, it is a long ways up through Kansas and Colorado, you know, where that water comes. There is a good deal of water comes from there, and to take it away would make a perceptible change. I think that all of the streams
5015 that flow into the Arkansas river, like the Grand, the Porteau, the Illinois and the Mulberry, flow now as much as they did
5016 in the earlier years, on the average. I don't know that their flow has decreased. I don't see any difference. Well, I should say, of course, that to take the amount of water that would come down through the Arkansas river—to take it away, it would make a great difference in the flow of the water in the Arkansas proper. Of course it has a great many tributaries that supply water, but if you cut that off it would make a great difference. I don't know what the volume of the Arkansas river is at Little Rock.

Cross-examination on behalf of defendants.

By Mr. HAYT:

5018 At the time I went up the river with the "Aunt Sally" in 1878 there was plenty of water in the river going up, and when we were up there we ran these excursions on the Walnut river. There had been a flood just previous to that in the latter river, and we found plenty of water to run up and down that river for seven miles—we called it seven miles—and we remained there six days. Yes, the water fell very rapidly in the Walnut while we were there. It was falling all the time. When I
5019 first got there there was about twenty feet of water and when I left there they could ford cattle right across in front

of my boat. This was on the Walnut river. I suppose there was about three feet of water. This was on the 4th, 5th, 6th and 7th days of July. I didn't bring any cargo down, because it was not safe on account of the falling water in the Walnut river and in the Arkansas. The "Aunt Sally" drew about sixteen inches light
5020 and two feet when loaded. Yes, we got around once or twice in coming down by taking the wrong shoot. In all my long
5021 experience in boating on the river here and elsewhere and from my experience in 1878 and since that time on the Arkansas river, I regard it in the upper reaches, in the vicinity of Wichita and above Fort Gibson, as a very treacherous stream, incapable of practicable navigation, yes, sir.

You understand in regard to this purse offered by the people of Arkansas City, I don't know anything about the railroad part of it, but the purse was for $700, offered for the first steamboat that would come up to Arkansas City to get it. I was taking the chances of going there and getting it, and I got left. They had a string to it. Undoubtedly it was the case that it was a scheme to have some influence on the building of a railroad, because the people of Arkansas City and Winfield, those people there of course they wanted to get a railroad there, and I understood as much, and they came with me down to Fort Smith. I had four people from Winfield and Arkansas City and the vicinity, on the boat there that came down with me to Fort Smith to see what could be done. In the meantime
5022 there was a lot of money made up, seven or eight or ten or twelve thousand dollars, and they got me to draw the plans of this little boat called the "Cleveland." She belonged to the United States Government. I helped to plan that boat and the barges and they paid me $5 a day for my services. After that trip was made, within the next four or five years, railroads were built through the country along the river, and the building of those roads greatly lessened the freight rates and made it unprofitable to attempt
5023 any navigation even in a small way on the river. A boat that will draw about sixteen inches of water now would carry in the neighborhood of a thousand bales of cotton. That has been the condition for about forty years. They will draw less water than a boat would light, without anything on her, forty years ago.
5024 To sum it all up, the Arkansas river is a river of shifting sands and varying depths of water, yes, sir, and always will be as long as time extends. I don't think there is money enough in the United States Treasury to make this river navigable the year round under any conditions whatever.

5029 P. R. VAN FRANK, JR., Little Rock, Arkansas.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I reside at Little Rock, Arkansas, and at the present time am a civil engineer for the War Department. I have occupied that position for twelve years. I came to Little Rock from Rolla, Missouri. I have been practicing my profession as civil engineer for twenty years. I am a graduate of the Missouri School of Mines, in the class of 1885. My duties at the present time have to do with the preparation of plans for the improvement of the various rivers embraced in this district and the compilation and filing of any records bearing on the engineering features connected therewith.

This district embraces the Arkansas river and its tributaries,
5030 the White river and its tributaries and the St. Francis river.

My superior here at present is Major Graham D. Fitch. He has been in charge four years this month. His predecessor was Captain Robert McGregor. Major Sibert, then known as Captain Sibert, was here from 1894 until along in 1898 some time, I think. I served under him in the same capacity as I am serving at the present time.

Yes, since my connection with my present position it has been part of my duties to observe the flow of the Arkansas river from Fort Gibson down to its mouth. When Captain Sibert was here in charge a report was made by him in respect to the taking out of the waters of the Arkansas river in Colorado upon the flow of the river. I have that report. It is dated April 21, 1898. The
5031 occasion of that report was that a man named Smith living up west of Wichita complained that the use of the water in Colorado for irrigation purposes was affecting the flow of the water in the Arkansas river in his vicinity, and he wanted the War Department to protect him, or something to that effect. Yes, I gathered data and made a report to Captain Sibert in respect to this complaint. Yes, sir, the report made by Captain Sibert was largely based upon the investigation which I made and the report thereon which I made to Captain Sibert.

If the taking out of the water of the Arkansas river for irrigation in Colorado had any effect upon the flow of the Arkansas river at Fort Gibson and below, I couldn't find it from the investiga-
5032 tions I made at that time. If it had affected it I couldn't find any records that would prove that it had. I made a pretty thorough investigation, so far as I could find anything to go on. I interviewed old citizens and examined historical documents and matters of that character. Yes, since April 21, 1898, I have continued my investigations with respect to the volume of water in the Arkansas river from Fort Gibson to its mouth, but not with the intention of comparing it in any way with the effects upon irriga-

tion. I wouldn't say that there has been any appreciable decrease in the flow of the water of the Arkansas river since April 21, 1898, from Fort Gibson to its mouth. There hasn't been any diminution.

It is practically the same. The farthest up the river I have
5033 ever been with the intention of making any measurements is at the mouth of the Grand river, some two and a half miles below Fort Gibson. We have here, from below Fort Gibson, what is known as the June rise. In respect to the cause of that June rise, I would say rainfalls in southeastern Kansas, southwestern Missouri and eastern Indian Territory. I wouldn't say that what we call a June rise at any time was ever caused by the melting of the snows in the mountains in Colorado. It comes from local rainfall. By that I mean this—that the melting snows in eastern Colorado would never give us a flood here. I have never made any study of the river to any great extent above Fort Gibson.

5034 The taking out of the waters of the Arkansas river at Arkansas City and Wichita would have any appreciable effect upon the flow of the river at Fort Gibson and below. I think it would. The taking out of water above Wichita at an ordinary stage of the river we would not notice down here. Taking the water out of the stream at a point above Wichita in the ordinary stages of the river might have an appreciable effect in the vicinity of Fort Gibson. When I say we would not notice it, we would not notice it down in this part of the river about Little Rock. If the low water of
5035 the Arkansas river were taken out of the river above Wichita it would not affect the low water flow of the Arkansas river at Fort Gibson or at the mouth of the Grand. No, I don't know what effect it would have if it were taken out for irrigation purposes, nor what effect the seepage or return waters would have. There is no regularity in the current and no stability in the channel of the Arkansas river from Fort Gibson to its mouth. In some places the surface or channel of the river is wider than it was when I first came here, and narrower in others. The channel shifts all
5036 the time with every rise. Yes sir, part of the duties of Major Fitch, under whom I am employed, is to make a report showing the navigation of the Arkansas river and the craft employed in it. Yes, sir, I have examined the report made by Major Fitch for 1904, which shows the list of vessels which navigated the Arkansas river from May 31, 1903, to June 31, 1904. (Objection by defendants.) Referring to the annual report upon the improvement of the Arkansas river and certain rivers in Arkansas and Missouri, in charge of Graham D. Fitch, being Appendix W to the Annual Report of the Chief of Engineers for 1904, I will say that the matter contained on page 2100 is a correct statement of the vessels that plied on the Arkansas river and the amount of merchandise carried in that time. (Objection by defendants.)

5037 (Page 2100 of said report offered in evidence on behalf of intervenor.)

I prepared that table. I am satisfied it is correct.

Q. Referring to the report of Captain—now Major—Sibert, which you have testified to, state whether or not in that report it was stated that irrigation in Colorado had not had any appreciable effect upon the waters of the Arkansas river at this point.

A. My recollection is that the report don't say that. It may.

Q. The report referred to sums up as follows:—

"Summing up the records and testimony, I cannot state definitely that irrigation has decreased the navigable capacity of the Arkansas river, but it does appear that the length of the bed, in the upper and unnavigable portion from which the water entirely disappears, has been increased, and that these periods are of more frequent occurrence."

That is your conclusion from the investigations that you made?

A. That is Captain Sibert's.

Not that part altogether was made upon the report submitted to Captain Sibert by me. You see where he makes that final conclusion there, it was deduced from evidence that he personally
5038 obtained in the vicinity of Wichita, Kansas. At that time we could not see that the taking of water out in Colorado for irrigation purposes had any appreciable effect on the flow of the water from Fort Gibson down. We couldn't find anything that proved it had.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

We keep a record of the gauge heights through the Weather Bureau here at Little Rock, and from these records make an approximation of the flow of the river. A gauge reading of one foot under the present conditions would show that there is a flow in the river in the vicinity of eleven hundred cubic feet per second of time; a gauge reading of thirteen here might be anywhere from one hundred and fifty to two hundred and twenty-five thousand cubic feet per second. A gauge reading of twenty-four would show, as to the flow of the river, somewhere in the
5039 neighborhood of 350,000 cubic feet per second of time. As to the ordinary gauge readings of the river at ordinary stages, uninfluenced by any marked or excessive floods, I will say that the average gauge height or gauge reading here over a period of years is 7.8. That is the average height and shows in the neighborhood of between fifteen thousand and seventeen thousand cubic feet per second. It would take an extremely low stage of water to show a gauge reading as low as one or two feet, and anything below 2.5 feet gauge reading I should call an extremely low stage of water.

A gauge reading of 2.5 feet would show between 2,500 and
5040 2,750 cubic feet per second. This amount of flow comes from the upper Arkansas, the Verdigris, the Grand, the Canadian, the Illinois, the Porteau, the Vache Grasse, the Piney, the Petit Gen

the Foursche, the Cardin and the Palarm creeks. (Objection
5041 by defendants.) The principal rivers from Little Rock up to Wichita are as follows: The Little Maumelle, the Big Maumelle, the Palarm creek, Foursche la Fevre, Mulberry, Petit Gen, Illinois, Piney, Vache Grasse, Lee's creek, the Porteau, Camp creek, Cache creek, San Boy, Delaware, Canadian, Illinois, Grand, Verdigris, Cimarron, Kaw creek, and the Walnut. There are two Illinois. I never saw the Canadian but twice, and it was dry both times, and I can make no comparison of its flow as to these other tributaries.

If in Captain Sibert's report occurs the following:

5042 "The Arkansas river at Hutchinson, Kansas, on May 13, 1895, had a discharge of ten cubic feet per second, and daily discharges from June 1, 1895, to January 1, 1897, show sixteen cubic feet per second as the lowest discharge in that period; this small discharge was from August 31, 1896, to September 15, 1896,"—

in my judgment that amount of water would not have any appreciable effect one way or the other, whether it was taken from or added to the amount of water in the river flowing past Little Rock. I should think the river ought to have at least a thousand cubic feet per second up above Wichita in order to make the loss or increase, as it might be, show in the flow of the river at Little Rock. A decrease of less than five hundred cubic feet up there would not be detected here. Of course a very large increase might; perhaps a thousand cubic feet or something like that might be noticeable here.

5043 If the records of the Geological Survey introduced in evidence as Complainant's Exhibit A–5 show that the average flow of the Arkansas river at Hutchinson for the year 1896 was 150 cubic feet per second and in 1897 was 175 cubic feet, that amount might be taken entirely from the flow of the river and would not be noticed in our measurements at Little Rock. You see that 175 cubic feet per second there, which is the average, would correspond to just about .1 difference in gauge height at our minimum lowest stages, so you see we would not notice it when we get up six or seven feet on the gauge. If the low water flow above Wichita were taken away or if its average flow were entirely withdrawn, we would not notice it here. This is because the part of the flow of the Arkansas river past Little Rock comes from the tributaries I have mentioned above, yes, sir. No, sir, I could not give you the proportionate amount of the flow past Little Rock which comes from these tributaries and which comes from the Arkansas river above Wichita.

I could give you an approximation of the amount of flow
5044 coming out of the upper Arkansas and out of the Grand. For instance, supposing the Grand is running 330 cubic feet per second, we would expect the Arkansas, unless it is under the influence of a head rise, to be carrying about 225 cubic feet per second of time. In other words, the upper Arkansas in low water carries

about two-thirds of the water that the Grand does in low water. The Grand river is the larger stream of the two in ordinary and in extreme low waters.

In referring to Major Sibert's report of April 21, 1898, where he says, on page 13, "It does appear that the length of the bed in the upper and unnavigable portion from which the water entirely disappears has been increased," I think it means this (objection by defendants)—but I am free to confess that puzzled me when
5045 I first read it: We will take a concrete case. Supposing there was some stretch of river in the vicinity of Wichita that a mile of it went dry. I think he means where it used to go dry for only a mile it will now go dry for nearly two miles. You see the length of the dry portion has increased.

Where, upon the same page of Captain Sibert's report, he further says "and that these periods are of more frequent occurrence" (objection by defendants and by intervenor), I understand him
5046 to mean there, again taking a concrete case, that where the river would go dry in the early days maybe for a period of three weeks in the fall it will now go dry for a period of say six weeks in the fall.

About March 10, 1905, the river gauge at Little Rock showed a little over thirteen feet, which would indicate a flow of between 150,000 and 200,000 cubic feet. If that amount was flowing
5047 at Little Rock, any particular amount that might be withdrawn above the city of Wichita would be scarcely noticeable here, yes, sir. A Wichita flood turned loose on top of this water would make a show, but an ordinary stage at Wichita would not show here.

I referred in my direct testimony to the June rise here, which is liable to come at any time between the middle of February and the last of July. No, the amount from the melting of snows on the extreme western part of the Arkansas river would not have any effect upon that unless in floods. I don't know anything about the regularity of the June rise in the early years through the western portion of Kansas, being supplied from snows in the mountains. (Objection by defendants.)

Cross-examination on behalf of defendants.

By Mr. DAWSON:

5050 Oh, yes, the river is such a one as goes up and down in a series of years. That is, you may have four or five years of pretty good flow and four or five years of very low discharge. Those conditions exist. Outside of the low water year between 1898 and 1904, the period from 1898 to 1905 will average up with the past all right. In the investigations which were carried on in connection with the report of Major Seibert referred to, we considered papers purporting to represent the earliest histories and were not limited to the years 1896, 1897 and 1898 and when the

report says that we were unable to discover anything which
5051 would show that the use of water for irrigation in Colorado had interfered with the navigation of the stream from Fort Gibson down to its mouth, we were taking into consideration the history of the river from the earliest times of which we could get any account, yes, sir. Now, there is a portion of my report in there that might answer that question more fully. I don't know. In my report that I made to Captain Sibert on this question, after reviewing different testimony, I stated: "The statements of channel depths covering a period of over one hundred and fifty years do not show that these depths are decreasing." And in another place in comparing the gauge readings from 1872 to 1897 I say: "This comparison of gauge readings does not show that the river stages are getting lower."

These statements which I have just read from the report are the conclusions which I drew from the investigations made at that time, and they were correct and are correct so far as information could be had on the matters reported on at that time, yes, sir. (Objec-
5052 tion by intervenor.)

Here is another thing. This is the one I had in mind: After giving a review of an examination of low water discharges, I stated in that report—"The observed low water discharge of 1897 falling between these values," that is, between 1,090 and 1,580 cubic feet per second, "does not confirm the statement that the low water discharge is decreasing." Now, that answers your question if I have noticed any decrease in the flow of the water.

These extracts which I have read are a correct statement of my belief of the conditions at that time, yes, sir, and my belief was based upon personal investigations of the records and other facts in reference to the river which I examined.

5053 When I use the term "upper Arkansas" I mean that portion of the upper Arkansas above the mouth of the Grand river and going on up the stream, and my personal observations of that river have not gone nor have they been taken by me as far west as Colorado.

I know in a general way, yes, sir, that the rainfall throughout Arkansas, Kansas, Missouri and the Indian Territory on the Arkansas river and its tributaries is much heavier than it is in western Kansas and Colorado. I never made any measurements of the flow of the Arkansas river above the mouth of the Grand.

I am familiar with the river by observation. Oh, I have seen it in Arkansas City, Wichita, Great Bend, and then along in the vicinity of Coolidge, Syracuse and up in that country, but in Arkansas City and Wichita, Kansas, it was not in connection with official duties of this office here but at that time I made no measurements of the stream flow at all. I made no investigations of the flow of the river west of Wichita, no, sir.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

5054 In estimating the navigability of the river at Little Rock we could not neglect the upper Arkansas entirely, but we could safely ignore all the water that flows at ordinary stages above the city of Wichita. (Objection by defendants.)

5056 (Complainant's Exhibit A–1 introduced in evidence. Objection by defendants.)

DENVER, COLORADO, March 20–22, 1905.

5057 W. H. CODE, Denver, Colorado.

Direct examination on behalf of intervenor

By Mr. CAMPBELL:

I reside in Hollywood, California. I am inspector of irrigation under the Department of the Interior for the Indian reservations throughout the West. I have been engaged in irrigation since 1891. My first experience was as assistant engineer of Wyoming for a short time before going to Arizona to accept the posi-
5058 tion as chief engineer of the Consolidated canal system. Before going to Wyoming I resided in East Saginaw, Michigan. I am a civil engineer by profession. At the time I was assistant engineer in Wyoming Professor Elwood Mead was State engineer. My duties as assistant engineer were the measurement of streams, the survey of irrigation ditches, and looking up reservoir sites. Yes, sir, in the performance of my duties, it was necessary for me to travel over Wyoming. In the northern part of Wyoming I was quite familiar with the conditions prevailing there. In January, 1892, I went to Arizona as chief engineer of
5059 the Consolidated canal system. This system is the second largest irrigation enterprise in Arizona. There are probably 75,000 acres of land under irrigation by the entire system. I remained in that position a little over ten years, until August, 1902, and was then appointed to the position I now hold. Since then I have been building canals and putting in pumping plants in the various States in the West. While in Arizona I became familiar with the conditions prevailing in the Salt River valley particularly. That is where the enterprise I was connected with takes its water from, in the vicinity of Phœnix. My duties in connection with the position I now hold are the general supervision of all irrigation construction throughout the West under the Secretary of the Interior, receiving my orders from and reporting
5060 to him. I have charge of forty-seven Indian reservations, in North and South Dakota, Montana, Washington, California,
5061 Idaho, New Mexico, Oregon, Nevada, Wyoming, Colorado, Utah and California. All these reservations are located in

what is generally termed the arid region. It is necessary for the purpose of cultivating and producing crops on them that we have irrigation, with the exception of a few reservations in western Oregon and Washington and one or two in northern California. There are 48,000,000 acres, approximately, of unallotted lands on these reservations and approximately three and a quarter million acres of allotted lands. There are about 116,000 Indians
5062 located upon these various reservations. Approximately 200,000 acres are covered by canals on these reservations. I will not say it is all farmed. By using the unappropriated waters of the different streams from which we now take the waters for irrigation on these reservations, I should say a million and a half acres more could be added. It is necessary for the support of the Indians upon these reservations that the lands thereon should be cultivated. It seems to be their only hope for independence. Grazing lands are becoming a thing of the past on most of the reservations, and the game, of course, is pretty well cleared out, so to speak, and the Indian must farm or be dependent more or less upon the Government. These Indians can be made self-supporting, in my opinion, if the policy of irrigating lands now being supervised by the Federal Government is continued, without calling upon the Government for any support whatever. No, sir, these reservations cannot be made to support the different tribes of Indians thereon unless irrigation is practiced. I fail to see any way in which they could support the Indians without help from the Government.

5063 Yes, there are several instances where the stream from which we are taking water for irrigation purposes on the reservations rises in a State other than the State in which the reservation is situated. (Objection by defendants.) The Gila in Arizona rises in New Mexico before entering the Territory of Arizona. The Colorado tranverses a number of States before reaching Arizona and California, in which State and Territory Indian reservations depend upon that stream for their quota of water. There are other Indian reservations that contain sources of streams that subsequently flow into other States and Territories, notably the Fort Hall reservation in Idaho. The Snake river is the chief stream in that country, and the Indians obtain their water supply through a canal leading from the Snake river. It rises in Wyoming. Water
5064 is appropriated out of the Snake river in Idaho for the Indian reservation at Fort Hall for the Bannocks and Shoshones. The San Juan river traverses the Navajo reservation in New Mexico for a certain distance and subsequently enters Utah, and the Indians of that reservation depend largely upon the San Juan for their waters. The reservation is in New Mexico. The stream rises in Colorado. I am not certain that the source of the San Juan is in Colorado. The Oyhee river traverses the Buck valley reservation in Nevada and Idaho—that reservation is in both States—and subsequently passes on to Idaho from Nevada.

I think that is all I can recall at this moment.

Yes, on these different reservations where the streams rise in a State other than that in which the reservation is situated we have now sufficient water by prior appropriation to irrigate the lands that have already been reclaimed, and we have an appropriation
5065 sufficient to irrigate an additional acreage; and in some instances we appropriate water beyond the present capacity or rather the needs of the present irrigated area, because we are allowed a certain number of years in which to complete our works.

While engaged in these various occupations, and particularly since I have been connected with the Government, I have travelled over the arid region to quite an extent. In Arizona I should say approximately half a million acres could be added to the irrigated area by impounding flood waters of the Verde, the Salt, and the Gila and its tributaries, and diverting the Colorado. In my judgment, unqualifiedly, the future development of the arid region is dependent upon irrigation to a large extent. If the irrigated area should be confined to the lands bordering on the stream, say for half or three-quarters of a mile from its banks, the effect would be to put a stop to all development, and such development as has been made would become of no value and our west would go back
5066 to the desert, as I understand it. As to the effect upon the present development in the Indian reservations, I would say they would suffer very materially if irrigation should be confined to the lands immediately bordering upon the streams. Yes, sir, on these different Indian reservations irrigated the water is taken to considerable distances from the streams. The best lands are back from the streams—one-half to five or ten miles back,—and the effect of such a condition as you named would stop all future development. It would make the Indians on these different reservations dependent upon the Government for their support to a large extent.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

There are none of these Government reservations which I have enumerated upon which no Indians are found.

5067 The Pima Indians are located in the Gila River valley in Arizona. This is one of the forty-seven reservations I spoke of. The Pima Indians are in a very good condition at the present time. They have suffered a good deal during the past four or five years from drouth, in common with all the settlers of the Salt River valley. As to the cause of that suffering, there is a shortage of water there. As to the cause of that shortage of water, there has been a great shortage of rainfall, primarily, and then there have been changed conditions in the country generally due to over-grazing at the headwaters of the Gila and other rivers in Arizona, so that any rain that now falls is precipitated at once into the stream in the shape of rapid and high floods, carrying immense quantities of silt. (Objection by

defendants.) This is due to over-grazing on the head-waters of our streams. During the time when the Pima Indians were suffering from lack of water there was complaint, yes, sir, that the water had been taken out above the ditches that have been supplying their lands. (Objection by defendants.) That complaint was well
5068 founded in a degree, but not to the degree that many people contemplate as proper. (Objection by defendants.) It was well founded in fact, but there might have been a difference as to the degree. As to why anyone could not go above these ditches that furnish water on these reservations and divert the water,
5069 I will say that the law of appropriation would defeat that. (Objection by defendants.) So taking the water above would certainly be a great damage to the prior appropriator below if the water were taken away from him above. (Objection by defendants.) It might entirely ruin his property that has already been acquired and built up. (Objection by defendants.) My idea is that, respecting all prior rights below, you would then proceed as far as practicable to take the flood waters that are not appropriated by the parties below and apply them at other places. In so doing you would largely increase the
5070 amount of land that can be irrigated and at the same time protect the parties who have prior rights below. Yes, sir, that is the method on which we have proceeded. It is my understanding that the prior rights of all settlers will be fully recognized by the Government subsequently to the construction of those large irrigation works throughout the West. I think priority should extend across the State line. (Objection by defendants.) As to whether I would pay any attention, then, to the State line, I would say yes, but I should want to make some qualification to that.
5071 (Objection by defendants.) In the event of a great loss of water in conveying a head of water to an earlier appropriator located many miles down a stream which is more or less sandy, I think it would be bad policy to waste a great quantity of water to simply supply him with a very small head.

Yes, sir, I am acquainted with Milk river somewhat and know the fact of a controversy existing between the United States Government and the Canadian government over the appropriation of Milk river. (Objection by defendants.) Milk river flows from
5072 Montana into Canada and then from Canada into Montana and finally into the Missouri river. Yes, sir, that is correct. I believe it to be the case that the waters were first appropriated by settlers in Montana below the line where it crosses from Canada into Montana. (Objection by defendants.) I am not sufficiently conversant with the conditions up there to answer the question as to the extent of the damage to the Montana settlers. (Objection by defendants.) I believe the controversy grows up because of
5073 the subsequent diversion of waters by settlers in Canada to the alleged injury of prior settlers in Montana, and it is my

understanding that that is pending before the Government at the present time.

In the States I am familiar with land along the streams in those different States and Territories prior to any irrigation had practically no value prior to the diversion of waters, and these lands were practically unproductive down to the banks of the river.

5074 Snake river has been appropriated on some of these reservations that I spoke of in Idaho, and this water comes from Wyoming. If the State of Wyoming should claim the right and should exercise the right to take all of that water in Wyoming, it would materially decrease the flow of the Snake river in Idaho and would cause injury to both the Indian settlers and the whites along the line of the river. (Objection by defendants.) That injury would be material.

5075 There are irrigated lands in New Mexico on the San Juan river, which rises in Colorado. If all the waters of the San Juan river should be diverted by Colorado above the State line, it would of course effect an injury to the settlers in New Mexico (objection by defendants), and that injury would be material and substantial. If they lost any water, it would be quite a substantial injury, in the West.

If the State of Colorado should claim and exercise the right to take all of the waters of all rivers that rise within her borders and apply them within her own borders to irrigation, as to the effect on prior irrigation interests and irrigated lands in the States lying below the borders of Colorado, I would say it would have a serious effect, of

5076 course, on all other States now receiving water from streams that enter those States from Colorado. (Objection by defendants.)

I am somewhat acquainted with the Laramie river, which rises in Colorado and flows through Wyoming, and have understood within the last two or three years that they have dug large irrigating ditches on the Laramie river in Colorado just south of the State line. If the State of Colorado should claim and exercise the right to take all of such waters, it would have a serious effect on

5077 the prior appropriators. (Objection by defendants.) I know there has been some controversy over the waters of Sand creek because of similar conditions, but I did not know that the case had been decided. (Objection by defendants.)

Cross-examination on behalf of defendants.

By Mr. HAYT:

5078 We find that the longer the land is irrigated in Arizona the less water is needed for irrigation. Yes, we found evidences of prehistoric irrigation in Arizona. I traced a number of old Aztec canals throughout the Salt River valley there, and in fact took advantage of some of the earlier construction when I was building the large Consolidated Canal system. We utilized a portion of the old Aztec

canal which was made through heavy gravel, boulders and cement. That was quite a large canal, and I have followed their lines for many miles with surveys to ascertain the nature of the engineering that was done in the early days. It is known as the Montezuma canal. The Montezuma canal received its supply of water from Salt river, and it was approximately twelve feet wide on the bottom. It would carry in the neighborhood of one hundred second-feet. The grade for the lower six or seven miles approximated 2.5 feet per mile, and was such a grade as we would now establish in that country with our present knowledge of hydraulics and our knowledge of the safe velocities for waters in that particular soil. There were many other canals that
5079 were even larger than this one. Approximately, the length of this canal was fifteen miles, and I should say it would irrigate from ten to twelve thousand acres of land. I did not discover any evidences of land having been cultivated and irrigated in prehistoric times from water supplied through that canal, no, sir. The entire valley, however, is of a character that would lend itself to irrigation very readily, and undoubtedly large areas of land had been farmed previous to the settlement there by the earliest Indian tribes. Yes, a large degree of skill was shown in the surveying and laying out of this canal and the fixing of grades and the selection of the route for the canal by those ancients who constructed it. It was built very much as we now construct our canals; not
5080 quite so finished. The slopes in the rock cuts were not true, and the implements that they had to make headway in this rock or cement formation must have been quite crude, from the way the work was performed; but the alignment was very good and compares favorably with the canals of the present time; the
5081 embankments had app-rently been built with considerable care. There were no fills on this particular canal, but I have observed fills on other canals that were quite extensive. In one instance, as I remember, the canal was elevated above the surrounding surface some four or five feet and carried across a low swale for a distance of probably half a mile. We would find traces of canals at different places in the valley, but the line was not sufficiently continuous to afford any idea of where the canal left the river.
5082 It is the policy of the department to give the Indian water for his land subsequently to the allotment of the land in severalty and throw him upon his own resources and endeavor to make a citizen of him, and it has been quite encouraging
5083 up to date. It seems to me that the tilling of the soil by irrigation in the arid region is the only real solution of the Indian question, to give him a piece of land and teach him how to farm it. The Indians now are farming quite extensively in a number of States and Territories, especially in the Crow reservation in Montana, where they have a very fine system which has cost to date approximately three-quarters of a million dollars, chiefly of tribal funds. They are receiving allotments of eighty acres of

irrigable land on that reservation and are making considerable progress in farming.

On the Yakima reservation in Washington I constructed a large system within the past year for the Indians of the Yakima reservation, and that system will ultimately cover 75,000
5084 acres of land. At the present time there are 27,000 acres of land farmed on this reservation, but not altogether by Indians. The department allows an old Indian or an Indian unable physically to till his own land to lease his land to white men, so that at present there is an area of 27,000 acres that is being farmed there by whites and Indians combined, and there will be a very much larger area before long, as the system is being extended right along. Yes, the Indians look after their laterals to some extent and attend to the irrigation themselves. Those who farm do very well. Possibly from one-third to one-half of the lands I have spoken of are farmed by the Indians.

From personal observation I cannot state fully what the effects have been upon those rivers resulting from the grazing off of the grass upon the headwaters of the streams previous to the
5085 year 1892 in that country, but I know from the testimony of many of the earlier settlers that conditions have changed materially throughout all of northern Arizona with respect to the over-grazing on the headwaters of the various rivers, and at one time, some twenty-five to thirty years ago, the headwaters of those various streams, that is, the lands supplying the water sheds of those streams, were covered with bunch grass ranging in height from two to six inches, I understand, and the rain falling on that grass would find its way slowly to the rivers and there would not be the erosion that now occurs. Within the past twenty or twenty-five years all of the sheep and cattle have grazed all over the water sheds in northern Arizona, and this grass has been eaten off, and the sheep have been turned on the country after the cattle left, and the headwaters are simply like a road now—hard packed and all vegetation gone. Heavy rain falling on such soil of course causes great erosion. Every little sheep or cattle trail subsequently becomes a great ditch or cañon, and the run-off is very rapid, consequently the rivers do not hold up as they used to when they had grass and the forests were in better condition, and the effect has been to decrease the usual normal flow, yes, sir.

It is usually more economical to use the waters for irrigation near the source of supply.

5086 No, sir, I would not think it advisable to take a stream like the Arkansas in Colorado and western Kansas, with a sandy, absorptive bed for two hundred and fifty miles through Kansas and during the dry season allow the water to run in that stream and not to be used in the State of Colorado, for the purpose of supplying parties low down in the State of Kansas. It is true, I believe, that it frequently happens in the distribution of water for irrigation that it cannot be distributed according to the priorities by

reason of inability to get the water to those having priorities lower down the stream. I have never happened to personally come in contact with just that particular condition, but I know it to be a fact from observation and from what I have been told by other men. Yes, sir, I am clear that it would not be advisable to deprive those near the sources of a stream, of water that could by no possibility get down below over a long stretch of absorptive sands.

5087 No, sir, I don't know that it is possible to take all of the waters out of the San Juan river for the purpose of irrigating lands in Colorado. I have made some observations of the question of return waters in Arizona, but not extensively, and it showed that there was a certain proportion of the water that was used on the lands that got back to the stream again. Yes, I am satisfied that that proportion is increased by the cultivation of lands for a series of years. From my observation there and in other States I feel that that can be stated positively.

5088 In regard to the productiveness of lands in the West generally as compared with the productiveness of lands in the East not irrigated (objection by complainant), I would say the western lands are, in my opinion, much more productive than the eastern non-irrigated lands, provided the western lands are farmed in the manner that will insure the best returns. In Arizona a family of five can live very nicely on twenty acres of land, provided they are given a sufficient water supply, of course. I should say that twenty acres of land in Arizona with plenty of water would be equivalent to sixty or eighty acres in the Eastern States.

5089 With reference to the diversity of crops under irrigation, that is what gives the land in the West the greater value—the fact that they can raise a diversity of crops. Yes, my observation is that you can grow a greater variety of crops—fruits, etc.—in the West, and the production per acre is very much larger. In Arizona we have practically ten months in the year when the lands will produce. For instance, we raise from five to six crops of alfalfa. It seems to be the policy in Arizona at present to settle on smaller holdings. That is the tendency everywhere of irrigation. That is my observation. The lands in Arizona of which I have spoken will produce great crops of alfalfa, possibly six to seven tons a year per acre. Melons will bring $100 an acre per year; Thompson's seedless grapes will bring over $100 per annum; onions and vegetables of all kinds bring in a very high return per acre. Oranges will bring in from two to three hundred dollars, in some instances, per acre.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

5090 No, sir, in answer to a question in my cross examination by counsel I did not mean to carry it to such an extent that you could take the water of a prior appropriator simply because some-

where up the stream you might find a place where it could be somewhat more economically applied. As I understood his question, it would be impossible to get the water to the prior appropriator. I do not think it would be proper to take the water away from that prior appropriator without any compensation. (Objection by defendants.)

A ditch ten feet wide and flowing eighteen inches deep, with a grade of a foot and a half to the mile and a slope of two-to-one will carry approximately 22 second-feet.

A ditch fifteen feet wide and eighteen inches deep, with a grade of one and a half feet to the mile and a slope of two-to-one will carry approximately 30 second-feet.

A ditch twenty feet wide and flowing two feet deep, with a grade of 1½ feet to the mile and the same slope will carry approximately 66 feet.

A ditch 30 feet wide at the bottom, sides sloping two-to-one, flowing 2 feet deep, at a grade of 1½ feet to the mile, will carry 96 second-feet.

(Objection by defendants.)

5091 Now, these calculations are approximate, of course. I would need to be given a little time to give you exact figures.

Recross-examination on behalf of defendants.

By Mr. HAYT:

I do not think it is possible to take all of the water out of the Snake river in Wyoming for the irrigation of lands in Wyoming, no,
5092 sir, but I have not traversed that stream so I cannot say. It would be impossible to rob the stream entirely in Wyoming, because there are other tributaries, of course, that feed it below, so that Idaho would not be entirely shut out of water.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

In speaking of the effect that grazing upon the lands in Wyoming has upon the flood waters, it is my understanding that the same condition has been producee in the same way throughout the entire arid region upon streams there and that it does prevail to quite an extent at the headwaters of nearly all of our streams in the entire arid region. But they seem to feel the effects of this grazing down there in Arizona worse than in some of the other States and Territories.

5094 Approximately a million and a half dollars has been expended up to date in the construction of ditches that have been erected upon the Indian reservations under the supervision of the Federal Government. These reservations do not include any

that are owned by the five civilized tribes. Assuming that there are two million acres or thereabouts that could be irrigated on all Indian reservations in the West, it would cost in the neighborhood of twelve to fifteen million dollars, I should say, to take care
5095 of that area. The Government started out on this policy in regard to the Indian reservations seven or eight years ago, I think. Of course before that they had given certain moneys each year to the various agents scattered throughout the country, and they expended this money to the best of their ability in constructing a lot of small ditches, some of them very, very poor, and it started out about six or seven years ago on a different line, and since then the ditches have been of a better character.

Oh, yes, they have been irrigating in Arizona for probably one hundred or one hundred and fifty years that we know of. When the Spanish explorers came through there many years ago of course they found Indians farming lands on the Zuni reservation, and also in Arizona. Yes sir, they had also been irrigating on the reservations in Montana and on the Big Horn reservation in Wyoming for many years to a greater or less extent. The Indians had done some farming before the Government offered or rendered any assistance by irrigation methods. The Pimas of Arizona were especially industrious on that line, and in New Mexico on the Zuni reservation there had been irrigated lands long prior to the time when the Government took any hand in irrigation. Yes sir, each year there is a certain sum set aside for irrigation on the Indian reserva-
5096 tions. In addition to that a certain amount of tribal moneys is being expended from time to time on the various reservations in the West. That has been true for six or seven or eight years, and to some extent previous to that time, if I understand you.

5097 JOSEPH M. CAREY, Denver, Colorado.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I reside and have resided at Cheyenne, Wyoming, for thirty-five years. I was United States attorney, and then was on the territorial bench. I was mayor of Cheyenne, a delegate in Congress three terms, and was in the United States Senate one term. When I went to Wyoming there was no development whatever along agricultural or horticultural lines. When I first went to
5098 Wyoming it had a population between ten and eleven thousand; it has now over a hundred thousand. When I went there I think it had taxable wealth amounting to five or six millions, which was largely belonging to the Union Pacific Railroad Company. I should say that the taxable wealth of the State, if you would get it all, at the present time would probably be one hundred and fifty million dollars. The assessed valuation is forty-one mil-

lion. This taxable wealth is largely dependent upon irrigation.

5099 I believe that we could add to the irrigated area in Wyoming, by using the unused waters of our streams and by reservoiring the flood waters, between four and five million

5100 acres, in the end. In 1871 there was irrigated by the Greeley colony in Colorado about fifteen hundred acres, and they thought that was their limit at that time. Within the last fifteen or twenty years over this valley along the Cache la Poudre they have spread out until they are within forty miles of Cheyenne. This has been done by storage reservoirs and by the storage of water in the soil and holding it back. I believe that within one hundred years from now these States in the arid region, if there are no decisions adverse to the use of the water that they appropriate—that a very large acreage will be brought into bearing, an acreage that will compare very favorably with the acreage of such States as Pennsylvania or the States in the extreme East that cannot be said to be the greatest agricultural States.

5101 Assuming that four or five million acres can be added to the irrigated area in Wyoming, I think it is easy to see that the State will carry a million or two million people when that point is reached, easy enough. To-day this unreclaimed land has no positive value. The people who are grazing on the Union Pacific Railroad lands pay, I think, all the way from two to five cents per acre annual rental, and the Union Pacific Railroad Company pays the taxes. The irrigated land in Wyoming is increasing in value

5102 from year to year as it is becoming more intensively cultivated. Based upon results in other places, I would say that the unreclaimed lands in Wyoming, if irrigated, in twenty to twenty-five years from now will be worth $50 to $150 per acre. Some, I believe, has sold as high as $200 an acre in this valley, in the Greeley colony. There is no reason why it should not bring just as high a price anywhere where the altitude is not over 5,500 feet.

I understand what is known as the doctrine of riparian rights. If that doctrine had been enforced in Wyoming, I do not believe there could have been any development along agricultural and horticultural lines in the State in their entirety. I will put it that way. They could not have reclaimed the lands at all by irrigation if that doctrine had been enforced; and in the future there could be very little development in the way of agriculture in the arid region under that doctrine. If the irrigated area were confined to the lands bordering on the stream, within half or three-quarters of a mile

5103 thereof, it would be very small. I do not think it would irrigate two per cent.

I am familiar with the conditions prevailing in what is known as the arid region. I believe the conditions that prevail in Wyoming extend generally throughout the arid region. I believe the future of the arid region depends upon this water in the streams and that

it is necessary for the growth and prosperity of this country that the people should generally have the right to take the water up to the extent of the acreage the water will irrigate and reclaim. That is the only value of water, as I look upon it, in our country. I have taken a great interest in this question for a number of years. It is a very interesting one to me.

5104 I am the author of what is known as the Carey act, passed by Congress August 18, 1894. In Wyoming, the State engineer there told me there had been between five and six hundred thousand acres segregated, some of which has been reclaimed

5105 and the balance are in process of reclamation. Yes, sir, a very large amount of money has been invested there under the Carey act. The operation and the success of that act depends upon the doctrine of taking the water out of the streams and applying it to the lands for irrigation purposes. The doctrine of riparian rights, if enforced, would destroy the effect and purpose of that act.

I am familiar with the act of Congress known as the reclamation act, although I have not given that act very much study. I believe the successful operation of that act depends upon the abrogation of the doctrine of riparian rights. For instance, to illustrate: The Government has started out now, I think, to expend about

5106 four million dollars in the Platte valley in Wyoming. They commenced the construction of their irrigation works about one hundred miles west of the boundary line between Wyoming and Nebraska. The scheme contemplates the impounding of the waters of the Platte at Alcova and irrigation first with a reservoir that will cover 22,000 acres of land, and then the construction of irrigation canals along either side of the Platte river; but one of their principal works will be near the border line—the boundary line between Wyoming and Nebraska—where they will divert the water by a diversion dam at that point, and they will use this water in the reclamation of a very large amount of land in western Nebraska, and I understand the Government has asked both the State of Wyoming and the State of Nebraska for an apportionment of water for these canals after they are constructed. If the irrigated area should be confined to lands bordering on the stream, say half or three-quarters of a mile therefrom, the good that would be done would not be commensurate at all with the cost of the projects. Undoubtedly the best lands in the arid region generally are those

5107 away from the streams three or four miles, what we call bench lands. The best lands we have in this country are on those bench lands and not in the valleys.

The lands that produce crops because of sub-irrigation in this country are of very little value as a rule. Sub-irrigation drives to the surface the salts that are in the ground, and it almost entirely destroys the productiveness of the lands, and they have no great value.

I irrigate some land myself. It is situated on a stream known as the Box Elder in Wyoming, which is a tributary of the South Platte.

I have between two and three thousand acres. I am also interested in an irrigation company known as the Wyoming Development Company. I am president and general manager of it. It was organized in the '80's. It operates in Wyoming. The water is taken from the Big Laramie, through a tunnel under a mountain, and turned into the headwaters of what is known as the Blue Grass, which is a dry stream except when the snow is melting. The Blue Grass is a tributary of the Sybelle, and the Sybelle is a tributary
5108 of the Laramie river. The water is taken directly from the Sybelle, into which it is turned from the Laramie river. The altitude is about like that of Greeley, and the lands irrigated constitute the plateau between what is known as the Chugwater, the Laramie and the Sybelle, the waters going back in the valley of the Laramie. The bulk of the waters that the company used for irrigation purposes is taken from the Laramie river, which has its rise or source in Colorado. We contemplate the irrigation of about 75,000 acres. The company irrigates about 50,000 acres. We have made an appropriation of water sufficient to irrigate 75,000 acres. I was
5109 one of the projectors of that scheme. Most of them "laid down" and I stayed with it more as a matter of pride, because I never made a dollar out of it. But we really have accomplished wonders. There was not a drop of water of any kind on this plateau—spring water—when we began. There may have been at certain times of the year water accumulated a little in a lake or something like that. The land was practically valueless.
5110 You could buy land at that time from the Union Pacific railroad on that whole plateau for fifty or seventy-five cents an acre; now, while it is not settled, it is all dotted with the houses of farmers, who are making a living and something more. We have a town there called Wheatland, with fine school buildings, a graded school, three churches, a large flouring mill, etc. The men who went into that enterprise put in in the neighborhood of a million dollars. And all this enterprise depends upon the waters of the Laramie river. The scheme would not have been undertaken if it had not been for that river, and never would have been undertaken if the waters of the Laramie river had not been free at the time. If the waters of this river were now to be taken by persons on the Colorado side to irrigate lands in Colorado, this Wheatland colony and the immense investment I have mentioned would be destroyed.
The lands cannot be cultivated without irrigation. (Objec-
5111 tion by defendants.)
No, if the water is taken out above the State line of course it would not flow down below, and we could not use it. (Objection by defendants.)
Yes, there are several streams of water that flow into other States and that have their rise in Wyoming, viz: The Green river, the Snake river, which forms the Columbia, and the main portions
5112 of the Yellowstone. Yes, the North and South Plattes flow into Wyoming. The North Platte, however, rises in the

North park in Colorado. The North Platte, I suppose, on the meander line, must flow five or six hundred miles in Wyoming.

I was a Delegate in Congress from Wyoming when it was admitted into the Union as a State. We had no enabling act. After failing to get very much recognition in favor of statehood, I wrote to Wyoming and told them they had better have a volunteer constitution, so without authority of law a convention was called in the State, and without authority of law the delegates were apportioned to the several counties, and the counties were re-
5113 quested to elect delegates, and after they had done this they were called together by the territorial governor. Most of them were elected by consent. They then called a convention and formed a constitution without authority of law, and it was submitted to the people and adopted. I took that constitution to Washington with me and I wrote a bill and introduced it. I wrote a report, got authority from the Committee on Territories to report it, and it was reported and passed. In the meantime Senator Platt of Connecticut introduced the same bill in the Senate, went over there and got a report. We finally passed it. Yes sir, the constitution of Wyoming contains a provision to the effect that the waters of the State belong to the State, and the same provision is in the
5114 constitution of the State of Colorado. Wyoming was admitted by direct act of Congress, while Colorado had an enabling act, as I recollect it. The proviso, of course, in that enabling act of Colorado was that in case Colorado formed a constitution republican in form the President of the United States had a right to issue a proclamation, which he did. I never heard any claim made in Wyoming by anybody that it or its citizens had a right to take the waters out of the streams for irrigation purposes to the detriment or injury of prior appropriators (objection by defendants) in the States below, because it is impossible for us to develop this western country unless the priority of the appropriation of water is acknowledged. We cannot get along unless that is done, be-
5115 cause who is going to put their money into these irrigation projects if within one week after they have appropriated the water somebody who happens to be just over the line in another State can divert that water to some other use or purpose?

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

No, sir, I never have heard such a claim as that made in the State of Wyoming. Our constitution was not framed with the intention of taking the water away from somebody else after they had appropriated it, although the lower appropriator might have been located in the State below. (Objection by defendants.) No, sir, when our constitution was framed and when our State has developed
5115 in all its resources, as I have described it, it has not been upon the theory that that State or a citizen of that State

could, by virtue of its constitution, now claim to own and control all of the waters that rise in our State solely by virtue of State rights or State sovereignty. (Objection by defendants.) The whole theory of it is that prior appropriation of water of course gives the party the right—the man who appropriates it—gives him the right in the water forever for that purpose, regardless of State lines. Yes, sir, it was undoubtedly correct, where I referred a few moments ago in my testimony to an apportionment between the States of Wyoming and Nebraska for the benefit
5117 of both States, that it was upon this theory that I have just described. I believe that that is the only theory on which the arid States can be developed. When you have irrigated three or four million acres of land you have made a good State. You go back in some of the eastern States and you do not find three or four million acres well cultivated. As to the Green river, if you go upon the theory that Wyoming is entitled to all of the water that is precipitated or goes into the drainage of the Green river in the State, that Wyoming shall for all time have a right to that water, we stop all irrigation everywhere else and it all depends then upon whether Wyoming chooses to use the water or whether anything is done in Wyoming, because nobody is going below the Wyoming line if any such theory prevails and undertake any irrigation. Now, the Gov-
5118 ernment of the United States is a case in point. They believe now in helping these States because of their arid condition—helping them to develop the country. Now, about all the Government can do in the State of Wyoming is on the North Platte river. Because the Government goes into the State of Wyoming and commences those great irrigation plants up there, if the priority of appropriation does not prevail this four million dollars' worth of work, which will make a place there for a great many thousand people who go there and purchase land, would fail below. The persons who go there and reclaim that land are entirely at the mercy of the people in Colorado after the Government has done all that. Go up here on the tributaries of the North Platte—the Canadian, the Illinois, the Michigan—where the bulk of that water comes from—there are very few tributaries when you get into the State of Wyoming until you get to the Nebraska line. Now, if they can be deprived of their homesteads by somebody in Colorado cutting off all their water supply they cannot do a thing in the Platte valley without it. The success not only of the Carey act but
5119 of the reclamation act depends upon the fundamental principle that one State has not the right to own and control all of the water that falls within it solely for the reason that it lies above the lower State that may have used the water prior to that time. I have stated my idea about that. If the State of Colorado should claim that by virtue of her State sovereignty and her constitution she has the right to take all of the water that falls within her borders and apply it to irrigation within her borders, and that claim should prevail, it undoubtedly

would contract the whole reclamation service to the State of Colorado as to all the inter-state streams flowing from the State of Colorado.

(Objection by defendants.) Yes, sir, it would mean an im-
5120 measurable loss to all of those arid States. I will put it this way: There is enough water flowing through these States to make all of them very great States, and the rule must prevail, if we want to develop these States, if we want to live in them, that the man who goes and obtains an appropriation of water shall have the water to the extent of his appropriation forever, and he must never be debarred from it either within his State or outside of it.

When I went to Wyoming first there were a few places where there was bottom grass grown, but the hay area was very limited. I don't know along the North Platte in the entire valley where you could have cut five acres of hay before irrigation commenced—five tons in the entire bottom. The valleys that have practically become very highly cultivated under irrigation were arid at that time, and the aridity extended down to the river.

The corporation of which I am president is the Wyoming Development Company, located in Laramie county, seventy miles north of Cheyenne by wagon road, and ninety miles by railroad, and its postoffice address is Wheatland, Wyoming.

Recross-examination on behalf of defendants.

By Mr. DAWSON:

5121 There were no Colorado people interested in the Wyoming Development Company, no, sir, but a good many of the lands under the ditch company's canals are settled by Colorado people and from the East. I think the bulk of them who originally came, when we first commenced the settlement, were from the valleys of Colorado. Since that time they have come largely from Nebraska, Kansas, Iowa and as far east as Wisconsin.

5123 I think that all of the land under irrigation throughout the State of Wyoming is somewhere in the neighborhood of a million and a half acres. All of the Laramie plains that are irrigated at all are irrigated from the Laramie river, which has its head-waters in the State of Colorado, and I should think that would
5024 amount to about one-tenth of the entire acreage irrigated in the State, but I do not like to say. The Laramie river is a big
5125 river. Sometimes you could step across it and at other times it would float a monitor. Well, since they have been cutting off a little water in Colorado during the last four or five years we have noticed a great falling off in the water. If it had not been for this reservoir I don't know where we would have been. It is a practical demonstration of the theory of somebody coming and taking that which somebody else has appropriated before.

I belive that the return waters from the large irrigated tracts in Wyoming are very helpful where the water is not diverted from the drainage. I do not think that this seepage water maintains

the flow during the dry season. It helps it. In other words, to illustrate my point, you will very frequently find that after you have irrigated a tract for three or four years—sometimes the first year springs will break out in the lower lands and the water comes back. Those springs sometimes become living streams; but of course where it is diverted from the valley it is lost to that valley forever. If you would take out of a stream when it is flush
5126 a large amount of water and spread it over the land for irrigation, when it seeps back I think it equalizes the stream. Of course there is water lost in evaporation and plant life, but I think irrigation helps to level up the stream and maintain a regular flow. The amount that gets back as return water increases as time goes on and the lands become more thoroughly saturated. I believe in the idea of progression in irrigation and that the conserving of water, whether in the soil or in reservoirs, is of great benefit to this arid region.

5127 The highest duty of water can undoubtedly be had where you take it directly out of the stream and use it as directly as can be, and near the source of the stream it will give a greater service, yes, sir, except as you go to the southwest extreme in those mountains as a rule the water is of no use at the source for irrigation. But after you come down to where you strike lands acceptable for irrigation then the highest use of water can be gotten near the source, and in that way you avoid the loss of water in carrying it over long stretches of arid country. You also get the benefit of return waters, yes, sir.

I think the tendency of irrigation, which is a very good one, is to divide the land up. Very frequently men come to us and
5128 say, "Now, I have bought eighty acres of land. Forty is all I can attend to"—and sometimes they have one hundred and sixty—"and I would rather have eighty, and if you are willing, we will sell before we have paid a part of it." And we never raise any objection. I think the tendency of irrigation is toward the best possible farming.

5029 In our country up here the farmers want from forty to eighty and one hundred and sixty acres upon which to support a family. But I believe that a forty-acre tract with a good water right is sufficient to support an ordinary family, say of five, that is, carrying the ordinary agricultural crops. When you come to sugar beets, it takes an immense amount of labor. It is a question of labor, and of course of greater results. Or of potatoes.

No, the mere fact that Colorado claims the right to take all of the water rising within the State of Colorado would have no effect upon the reclamation act as to streams in Wyoming that do not
5131 rise in Colorado. It would not. I would add, if the State of Colorado has a right or the State of Wyoming has a right to use the water because it is in the State or rises in the State, without regard to prior appropriation in the State below, then every irrigation project undertaken by private capital or by the Government of

the United States on an interstate stream may be destroyed by somebody undertaking an irrigation project above.

In my answer to counsel in regard to the doctrine of appropriation, that prior appropriations must be recognized, I did not mean to say that the party appropriating must be allowed to have the water for all time after he has once appropriated it, unless he continues to use it for a beneficial purpose, undoubtedly. I think that is recognized in all the arid regions, that if you fail to continuously use it—I think our statute fixes it for two years—then the State, as the State has control of the apportionment of water inside of the State, repossesses itself of that water and allows somebody else to get it. In other words, the doctrine of appropriation throughout the arid States always recognizes that the water must be used for beneficial purposes, yes, sir, and when that use ceases the right ceases.

5132 As to the statement that in many parts of the arid region the courts have recognized the principle that the junior appropriator will not be compelled to relinquish the use of the water for the benefit of a senior appropriator where it appears that if released the water would not reach or benefit the senior appropriator, I would say I am not familiar with that. I think, however, that is the rule. That is the rule which would obtain the best results, yes, sir. In other words, I do not think if I took water out of a stream that you were taking above me any action would lie against me until you show that you have been damaged.

5133 To generalize, the development which has been made in the arid region of the United States and that which is to be made depends almost entirely on the utilization of the waters of that region for irrigation. Yes, sir, I believe it does. I do not think there is any doubt about it. And the enforcement of what *is* understand as the strict riparian doctrine, or even a limitation of the use of streams to a strip within a mile of the banks of the stream, would practically ruin the development that has already been made and prevent further development. Yes, sir, I believe it would. The water that rises in these streams in these mountains is absolutely necessary to develop the State and necessary in the sense that it must be allowed to be taken from the streams and spread upon the land, yes, sir, but priority of right must always be regarded; if you do not, the man who attempts to irrigate may wake up some morning and find that he has no water. So far as the streams of the arid region are concerned, I do not know of any possible use to which they can be put, either of commerce, navigation or other uses, that is in any degree as important as their use in the reclamation of the lands of the arid region through which they flow. But

5134 an incidental question arises, and that is, the power that is bound to be developed on the streams. The discovery of electricity is of course going to completely metamorphose or change the condition in this arid region with the power that can be developed on these streams in connection with irrigation, and fortu-

nately, it does not conflict at all with the use of the water for
5135 irrigation.

Now, we can live in this country by and through agriculture. We can become a wealthy country. We can support lots of people and give them good homes. But this irrigation business must be settled on a sensible basis and such a basis as will be a recognized basis in each one of these States, because one State can ruin what is taking place in another and there will never be any certainty at all to our existence here.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

No, sir, the citizens of Wyoming have never attempted largely to appropriate the waters of inter-state streams so as to endanger or ruin prior civilization in Nebraska, and I believe you know
5136 the idea is pretty generally recognized all through the country that the priority of right, that is, the priority of appropriation, gives the right to use this water in these mountain streams. I think that is the sentiment. (Objection by defendants.) In respect to what extent the water of the Laramie river was lowered by the use of water above in the State of Colorado, I will say that Sand creek, a tributary of the Laramie on the Laramie plains, I was at one time familiar with. (Objection by defendants.) It
5137 was a stream that in the spring was very high. Through the diversion of water in Colorado that has become virtually a dry stream and the people there who had good ranches have been greatly injured. Now, I am not testifying of my own knowledge at all about that, except just simply what is represented to me when I go there and see it, and seeing the different conditions now than existed a number of years ago when I was very familiar with it, that Colorado parties have been diverting this water over on the east side of the hills in the State of Colorado. As to what extent the diversion of the waters of the Laramie river lowered the flow of the river in Wyoming, I will say they have taken about all of the flow in the dry season that is up there, and we have been injured on our side of the hills. We were very much injured until we built a reservoir.

Recross-examination on behalf of defendants.

By Mr. DAWSON:

It is true, yes, sir, that the forests formerly existing along the head of the stream and its drainage have had a great deal of timber cut off. I was talking about this with a man up there. He says
5138 the timber has grown very much since it was first cut off by the Union Pacific Railroad Company.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

I am familiar with agriculture in the arid region. The production from an irrigated acre of land in the arid region is very much larger than in the humid region. For instance, on an irri-
5139 gated place I have seen harvested seventy bushels of wheat per acre. My father owned land in the State of Delaware, and, fertilizing it as highly as he pleased, I never knew him to raise twenty bushels to the acre. I have known of yields of a hundred bushels to the acre. I think the yield of grain, the average, in the States where it does rain, tells the whole story. We can raise here at times enormous crops of small grains, and more per acre than back east where they depend upon rainfall.

5140 CHARLES S. SLICHTER, Denver, Colorado.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

5141 I reside at Madison, Wisconsin. I am forty-one years of age. I hold the chair of applied mathematics in the Engineering college at the University of Wisconsin, which position I have held for nineteen years. I am also consulting engineer for the United States Geological Survey, since 1892. I have had charge of work on underground waters during all that time, generally, throughout the country. I made investigations in the valley of the Arkansas river, in the Cimarron valley in Kansas and Oklahoma, in the Mojave river in California and the Rio Hondo in California, the San Gabriel river in California, the Los Angeles in California, and on Long Island, New York, in the city of Brooklyn and in numerous other places; also in Wisconsin, but not under the auspices of the Geological Survey. Since 1896 I have spent most of the summer months in the field, and have done some work when called upon during the remainder of the year. Yes, I have supplemented this field work with investigations and other studies and treatises on the subject of underground waters.

5142 I put in a month in the Arkansas valley in 1901, near Dodge City and Garden City, most of it near Garden City. I spent about a month in the Arkansas valley. During the year 1904 I began work about the 7th of June, and the field party was in the field continuously up until the middle of September, and in October one man returned and remained there until some
5143 time in December; and later, under the instructions of Mr. Newell some work was put in this present year at Dodge and Kinsley and Wichita in Kansas. I was assisted in my work in and around Garden City in 1904 by Mr. Henry C. Wolfe, who was the principal assistant, and Mr. Ray Owen, who is engineering aide in

the reclamation service, and by a field party of nine to eleven members in minor positions.

The object of my investigations in and around Garden City during the season of 1904 was to make such investigations as to determine whether or not it would be practicable to recover ground water under the reclamation act for the irrigation of lands adjacent to the river. In order to determine the practicability of an irrigation project it was necessary to determine the amount and availability of the ground water supply. Yes, we did find underground or sheet waters in the vicinity of Garden City. The investigations stopped at Hartland, the narrowest point on the Arkansas river, about two miles west of Hartland and about twenty-six miles west of
5144 Garden. In determining whether there were underground or sheet waters there and its extent and the source of supply, the first thing we did was to divide the field party into two groups. The first sought to determine the velocity of the ground waters—to determine whether or not they were moving and how fast they were moving, and if moving, what was the probable extent of the underground stream. The other party, the level party, undertook to make an accurate topographical map of the water plane in the vicinity of the possible irrigation works. They undertook to map the level of the ground water surface over this area ten or twelve miles in extent north and south and sixteen miles, perhaps, in an east and west extent.

In determining the level of the ground water we found a large number of wells in use in the bottom lands and uplands which we used to ascertain as far as practicable the level of the ground water. We put in some test wells of our own for that particular purpose, and in addition to that we used the wells that we had put down in order to determine the rate of movement of the water as auxiliary wells for the determination of the ground water plane. In these two respects the work overlapped. We sank about 175 to 200 wells in 1904. I should say there were seventy-five at least, and
5145 possibly considerably more, wells already there. Most of the wells that we put down ourselves were in the first and second bottoms. A few were put upon the uplands, and some in the sand hill district south of the river. On each side of the river. There were wells already there on each side. The farthest wells on the north side that we put down ourselves were about eleven miles from Garden City and about eight and a half miles in a direct line from the channel of the river. On the south side the farthest wells we put down ourselves were two miles south of the channel. There were wells there that were farther north from the river than the ones we sank. They were on the uplands. The farthest
5146 wells we made use of were ten miles north of the channel. I put a great many down in the river itself, right in the channel. A great many of the wells were put down in groups for the purpose of making measurements of the underflow. If those were counted out, we would have half a dozen or four wells within

six feet of each other, and we would undertake to get wells within five hundred feet of each other on a north and south line at the various places where we made cross-sections. It was our object to make three principal cross-sections covering the area where we expected to recover the underground water for irrigation purposes. We found ground water there and it had a motion in every instance. It was flowing generally toward the east, corresponding generally with the main trend of the Arkansas River valley. The rate
5147 of movement varied in different places with the coarseness of the material. The average rate of all the measurements, including the slow and the fast, was about eight feet in twenty-four hours. Yes, there was a very large volume of water there. In the wells near the river channel we were able to detect fluctuations in the level of the ground water. At the wells remote from the river we were able to detect a seasonal change, but no other change. The greatest fluctuation occurred in the wells that were very close to the river. The most remote wells at which we noted fluctuations were nine hundred feet from the river, on the north side. We concluded from our investigations that the major portion of the ground
5148 water came from the rainfall on the lands north and south of the river. We were able to conclude that a very large portion of it originated in rainfall, and I can give a definite numerical answer to that if you desire to restrict the north and south limit.

At our first principal station, two miles west of Garden City, in the area included by the river channel and a line 2,500 feet north of the river, a little over two-thirds of the additions to the ground water was contributed by the rainfall and a little less than one-third contributed by the floods in the river, if the time be made to include a period of flood. So that makes a maximum contribution in that time from the flood, comparing the flood with the rainfall; that is, the maximum contribution from the flood was one-third in that strip 2,500 feet wide and extending along the river channel.

Q. Now, I wish you would give your reasons in detail as to why you concluded that the underground or sheet water derived its main supply from the rainfall and not from the stream itself. (Objection by complainant.)

5148½ A. In order to determine the relative amount of water contributed by the rainfall and by flood waters in the river, we placed test wells at various distances from the Arkansas river at our camp No. 1, two miles west of Garden City. The first test well is four hundred feet north of the river, and another test well is 1,120 feet north of the river, and still another 2,520 feet north of the river. Observations of the level of the water in the Arkansas river were made at least twice daily during the period from June 18 to July 11, and frequent observations were made upon the level of the water in the test wells. A model has been constructed which shows the fluctuating position of the ground water in the test wells near the river and the varying height of the water in the river and

the official record of the rainfall at Garden City on June 18 and July 11, 1904. A photograph of this model is presented as Fig. 1. The model referred to shows the fluctuations of the river and the fluctuation of these wells during the period of June 18, 1904, and July 11, 1904. I made a photograph of that model.

5149 (Said photograph, being Intervenor's Exhibit 3, offered in evidence.)

This photograph shows that the river and the water in the test wells remained stationary from 7 p. m. of June 18, 1904, to 7 p. m. of June 21, 1904. The four threads on that photograph represent the level of the water. The highest thread in the photograph represents the level of the water in the Arkansas river. The thread next lower on the diagram represents the level of the water in the well four hundred feet from the north bank of the river. The next lower thread represents the level of the water in the test well 1,120 feet north of the river. The thread nearest to the observer, in the photograph (Intervenor's Ex. 3) represents the level of the ground water in the well 2,500 feet from the north bank of the river. The scale of distances is shown in the cardboard nearest to the observer.

5150 The black marks on that checkered part of the photograph represent the official record of the rainfall as taken by the observer at Garden City between June 18 and July 11, 1904. The different elevations on the first thread referred to by me indicate the changes in the level of the water in the Arkansas river. The second thread represents the fluctuations of the water level in the test well 400 feet north of the river and the third thread represents the fluctuations in the level of the water in the well 1,100 feet from the river, while the fourth represents similar fluctuations of the water in the well 2,500 feet from the river.

From this photograph you can observe the effect of the rainfall and of the flood in the river upon the level of the water in the distance covered. From the photograph it can be observed that there

5151 was no material change in the level of the water in the river, or in any of the test wells from 7 p. m. of June 18 to 7 p. m. of June 21. It can be observed that on the night of June 21 a heavy rain of nearly one inch fell. The next morning observations in the test wells 400 feet from the river and 1,100 feet from the river showed a marked rise in the level of the water as indicated in the photograph (Intervenor's Ex. 3). The level of the water in the Arkansas river remained stationary until 3 p. m. of June 22, when a sudden flood swept down the river. In spite of this flood in the river, the water level fell during the period of flood in the test well 1,100 feet from the river; in the well located 400 feet from the river a slight rise of the water level is noticed, amounting to .1 foot. Following this, the ground water fell in both of the test wells nearest the river. The level of the water in the river remained substantially stationary from June 23 to July 11. The ground water reached its lowest position about July 3. On the

night of July 3 and on the nights of July 6 and 7 heavy rains fell. An inch fell on the night of the 3rd of July, over half an inch on the night of the 6th and about an inch and a quarter on the night of July 7th. The effect of these rains was to raise materially the level of the ground water in all of the test wells, the rise in the test well 400 feet from the river being greater than the previous rise observed in the same well, due to the combined effect of a single rain and a flood in the river. These rainfalls had no influence upon the level of the water in the river. The test well 2,500 feet from the river shows slight changes in elevation, due to the rainfall; but a rise follows the rain by a considerable length of time.

In connection with the heavy rain of the night of June 21,
5152 careful observations were made on the second bottoms and uplands north of the river to determine whether or not any of the rainfall ran off the surface of the ground into the Arkansas river or whether the same was absorbed by the soil. On June 22 I drove for about twenty-eight miles over the uplands and second bottoms seeking evidence of the influence of the rainfall. The only indications of erosion or running water or standing water were found in the highways, in many of which water had collected in the ruts, and the roads were muddy. Upon the native grasses of the uplands no standing water was found. Apparently, the entire rainfall had been taken up by the soil. The amount of that rainfall is one inch. Observations were made on the same trip in pits or dug wells which were not lined with masonry or boards, in which the increasing moisture due to the rain could be observed percolating through the sod and soil of the uplands.

The upright piece marked "feet" on the photograph represents the vertical scale which was used in constructing the model from
5153 which the photograph was taken. Each particular division represents one foot, which is subdivided into tenths of feet. The highest flood that was reached by it was 4.7 feet from the bottom.

Chemical tests of the waters in all of the test wells at various depths were made in the field, and, at frequent intervals, of the water in the Arkansas river. At the point two miles west of Garden City the water in the river varied from 73 to 93 parts per hundred thousand of undissolved solids; the water in the sand hills south of the river is very much softer, and the ground waters north of the river continued to get softer with the distance from the river, and also the water got softer in a marked degree with increasing depth from which it was taken, and softer than the ground water first mentioned. You have to go some distance from the river before the water becomes as soft as the river water. Observations taken at
5154 Sherlock, seven miles west of Garden, were very numerous and showed a marked contribution to the underflow from the soft water from the sand hill district south of the river where the soft water from the sand hills is observed to be pushing north the strong waters normally found under the first bottoms. The

strongest water at this point was found under the first bottoms, and the strength of the ground water was 107 parts per hundred thousand total dissolved solids. The river water at the same time contains 7¼ parts per hundred thousand of total dissolved solids. I have made a tabulation of a large numbers of these tests, tabulating the analyses first by distances from the channel, classifying them as first bottom, second bottom and upland wells. The waters thus classified show a marked decrease in total dissolved solids as we recede from the river valley. A like classification, with the depth, of a large number, sometimes shows a similar decrease in total dissolved solids, with the depth from which the same is taken, the various waters passing into each other by imperceptible changes.

Yes, the analyses of the water which I made at these different places is another indication which convinces me that the main source of supply of the ground water is the rainfall and not the stream itself.

5155 The other reasons that are especially pertinent in this connection is the conclusion that must be drawn from the slope of the ground water plane as determined from the levels which we ran. A map has been prepared showing the slope of the water plane north and south of the river. It is observed to slope toward the east at an almost uniform rate of about 7½ feet to the mile, and the river channel itself has a very slight influence upon this sloping of the water sheet. At many places the position of the river could not be located from the map of the water plane if its position was not known from other reasons. I have this map with me.

(The said map, being Intervenor's Exhibit 4, offered in evidence.)

5156 The blue-print is intended to show by contour lines the slope of the ground water; the heavy curve lines running nearly north and south represent places where the ground water is at the same height on the contour lines as marked with the elevation of the ground water above mean sea level. With some fluctuations, it shows that the ground water from the sand hills slopes toward the valley at an average slope of about 2 to 2½ feet to the mile, and indicates also a tendency for the ground water to slope toward the river from the north; but as a distance of 9 to 10 miles north of the river is reached the water plane slopes gently to the north, toward the valley of the White Woman creek, these north-and-south slopes in all cases having the average value of about 2 or 2½ feet to the mile, the easterly slope being almost uniformly 7½ feet to the mile.

In regard to the question as to whether the taking out of water from the Arkansas river in Colorado has decreased or perceptibly affected the flow of the underground or sheet waters, I have no direct information in regard to any changes that have taken place in regard to the perennial flow of the stream. Granting that the stream should flow at high water all the time in the future, bank full, continuously, changes in the ground water that I can see could

be brought about would consist in a possible elevation of the ground water in the narrow strip which we have observed is subject
5157 to the influence of floods in the river. That strip is less than 1,100 feet at the first station two miles west of Garden, is slightly in excess of 900 feet at Sherlock and is less than 1,100 feet at Deerfield. This last point I have not given testimony on as yet. Yes, that narrow strip is only affected in times of flood water. If the river should run forever bank full and raise the level of the ground water as high as possible, it is easy to compute that the added amount to the ground water would amount to about one-half of a cubic foot of water per second around Garden City. It is not a necessary conclusion that if it appears that this underground or sheet water in and around Garden City has gone down or become lower within the last fifteen or twenty years it could be attributed to the taking out of the waters of the river in Colorado for irrigation purposes. If the ground water has lowered it is not necessary to conclude that. As I have observed, the similar lowering of the ground water took place in so many other places following the settlement of the country that I do not feel justified in con-
5158 cluding that such a cause was necessary or pertinent. I have especially observed the lowering of the water plane in similar tests in South Dakota where I have been familiar with the prairies before they were opened to settlement until six or seven years ago. During that time I have observed the lake beds in many cases disappear and dry up, and the ground water level is shown by dug wells, to lower with the settlement of the country, the building of roads, the plowing up of the land, the cutting of the grass and other changes that man has made in making use of the country and changing it from its natural condition. In Wisconsin in my own county of Dane there were a great many small lakes or ponds that were meandered in the original survey of that country, some of these ponds containing several hundred or a thousand acres, which have now entirely disappeared and the land in their former beds has been cultivated and put to use. There are a great many ways in which the changes that are brought about in the settlement of the country can affect that. In some places the
5159 evaporation from the ground is greatly increased by cultivation or by changing the natural condition of the vegetation that already exists. Every furrow of a plow and every public highway and every railroad forms an artificial drainage line along which the precipitation may erode a channel and collect in low places and hence interfere with the normal way in which the water enters the ground or the streams.

I have made investigations to ascertain whether or not there was sufficient ground water to justify the Government in putting in pumping plants to raise it to the surface for irrigation purposes around Garden City. I prepared the plans of a project which proposes to take the ground waters near Deerfield and recover them by wells and put them upon the uplands. I have estimated that it is

practicable to recover at that place 100 second-feet of ground water for a period of 150 days during each year. The strip that it is necessary to use for such purpose must be 24,000 feet in length, in order to recover that amount of water with a depth of 300 feet. 300 by 24,000 is the cross-section of the underflow which it is proposed to intercept for that purpose, allowing, however, a considerable factor of safety in that estimate. This 100 second-feet of water pumped for 150 days to the surface will irrigate 15,000 acres in that country. At Garden City, seven miles below, we expect no effect upon the ground waters from the recovery at Deerfield. The plans were especially made to reduce such changes to a minimum. It would have no perceptible effect below Garden City.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

5160 I did not take all of the original measurements myself, no, sir. I took very few myself, but they were all made by my
5161 own party, excepting those of the rainfall, which was measured by the volunteer.

The well farthest north that was put down by our men was 8½ miles north of the river and two miles west from Garden City and was on the west line of section 2, township 23 south, range 33 west. It is eleven miles from Garden City. The farthest well that we sank ourselves was at the edge of the sand hills about two miles south of the river. We found a current to the ground water
5162 in all of the wells that were put down, and the average current was eight feet per day. The maximum velocity of this current was 22.9 feet at Sherlock, 700 feet north of the river, 7 miles west of Garden City and at a depth of 28 feet. The minimum velocity of this current was at Deerfield, being 1¼ feet in twenty-four hours, 1,800 feet south of the river, at a depth of 21 feet.

The flood that we measured came down the river on June 22, 1904, and lasted a little over two days. The rise of the water level in the well 400 feet north of the river was noticed three hours after the flood. We noticed no rise from this flood in the well 1,120 feet north of the river. It fell continuously until July 5.

5163 Q. Then how much of a rise in that well did you notice?
A. A total rise of about 19 inches.

There was no rise noticed in the well 2,500 feet north of the river due to the flood of June 22. The rise in the well 400 feet north of the river following the flood of June 22 amounted to .1 of a foot. It then began to fall immediately. The rise in the well 400 feet north of the river due to the flood remained for about 48 hours—probably a little less. The rise in that well lasted about as long as the flood, yes, sir. Of course the flood is a diminishing flood. The well 400 feet north of the river reached its height three hours after the flood reached its height.

The rain of July 3, 4 and to July 7 extended over the area as far

as we were investigating. We caught those same rains at
5164 our camp and measured them. Those rains did not have any perceptible effect upon the rise of the water in the river. Those rains from July 3 to 7 amounted to three inches and these rains did have an effect upon the wells back from the river. It is hard to give an answer as to how soon after the rain the effect was noticed in the 400 foot well, because we observed these wells at 6 o'clock in the morning when the rains were over and we found them high. The rains were during the night. Practically every rain we had was between 6 p. m. and 6 a. m., near midnight, all of these rains, and next morning we found the changes that have been testified to. The rise in the 400-foot well due
5165 to this rainfall amounted to .8 of a foot. There was no flood in the river at all. The rise due to this rainfall in the 1,120-foot well was 1.3 feet, and in the 2,500 foot well it was .1 of a foot at that time, but during that very time we ran a gasoline engine at the 2,500-foot well on a pumping test. I don't know whether that is the true amount or not. We made two ten-hour tests on the pumping plant at that time, because it was raining and we could call in our field party for that purpose. Yes, sir, the 400-foot well began to rise within three hours of the beginning of the flood in the river. As to how I account for that, I will answer that that is a very common fact. The ground water wave is changed very rapidly by any changed pressure at any place. The wave is transmitted with a fairly high velocity, similar to the observations we frequently make where a tide in the ocean affects wells a considerable
5166 distance from it with a lag of only a few hours. The river was running all the time, you understand, quite a good stream of water, the increase over the normal height being 1.6 feet. The flood added about 20 inches above the previous level of the water. Before the flood came at that time the channel was not flooded. There was a good stream of water flowing. We did not gauge it, and I dislike to guess at the number of cubic feet per second flowing there. It was enough to trouble us so that we wanted to work on the south side of the river and we had been prevented by the flowing water in getting over there. My first man arrived there about June 7, and reported by wire to me that the river was practically dry. I arrived there, I think, about the 11th of June and found 5000 second-feet of water flowing in the river. I don't know what the depth was at this point. There was probably about two feet of water in the river at this place. The channel of course is not
5167 level and the depth varies from side to side. We went swimming in quite a deep place in the river on the north side of the river, five or six feet deep. I should say the average depth was perhaps two feet.

5168 I don't know exactly where that flood of June 22, 1904, came from, following as it did the rainfall at that point by about 15 hours. It was not due to the run-off in that immediate

locality. There had been the rain at or near Garden City on the night of June 21, of course, that I speak of.

The average rate of movement of the overflow, being about 8 feet per day, I consider to be a higher average rate of movement than of ground water generally. The average rate of movement of ground waters, where they move at all, I would not want to put in excess of three feet in 24 hours. There are ground waters
5169 that do not move at all. I know of ground waters that have no perceptible movement. As a general thing, the ground waters represent drainage and seepage, and sometimes—I will say it is an exception to find a ground water lake rather than a ground water flow. It is exceptional, but not at all rare. It is true as shown by all of our measurements that the level of the rise of the ground water was greatest near the river. If the flood of June 22, lasting two days, had lasted two months or thereabouts at practically the same height that it reached, it would probably have kept that elevation in the 400-foot well north of the river at the observed maximum height. It would retain it there. Inasmuch as I observed no influence of the flood on the well 1,120 feet from the river, I have no adequate means of judging what influence it might have had upon that well had the flood lasted the suggested two months. This flood lasted only 48 hours. If that flood had lasted two
5170 months it might have extended and influenced the ground water level back farther from the river than the flood that lasted the 48 hours.

I made observations at Dodge and Kinsley and Wichita. Substantially the same conditions prevailed there as at Garden City. Our observations were not as extensive. At Dodge, Kinsley and Wichita I have no observations of the changes in the water plane or the effect of floods or rains. The surface of the water level in the 400-foot well was two feet below the surface of the ground when it was low, and when it was at its highest it was one foot. The water level was two feet and eight inches below the surface of the ground at the 1,120-foot well when the water was so low, and when
5171 high two feet below. The 2,500-foot well was on the second bottom and it was ten or twelve feet from the surface of the ground to the level of the water at that point. The changes between high and low water in the 2,500-foot well were not the same as in the other wells. It was very slight. The changes in that well amount to only one or two tenths of a foot. I can give those matters all accurately if you desire to have it so.

Yes, sir, I think that the rain of June 21 was practically all absorbed and none run off. It is true that the condition of the ground was such at that time that a rain of that amount would practically all be absorbed in the immediate locality. We could observe no run-off into the river channel. The running waters seemed to be mostly confined to the road-ways where it had followed the
5172 roads.

As to having made some chemical tests and finding the

waters back from the river a short distance nearly the same quality as the water in the river, I will say the waters surrounding the channel of the river were very much harder than the river water. After we got away from the channel of the river they began to get softer and softer, the waters being softer under the second bottoms than under the first bottoms, and under the first bottoms the water was harder than at any other place. The water under the uplands was still softer than the water under the second bottoms. I observed this to be gradual. As to the south side of the river, I was saying the difference south of the river in the sand hills is that there is an abrupt change to soft water because the sand hills begin abruptly and it is uniformly soft—deep or shallow, or far or near. When the sand hills abut on the channel of the river it is immediately noticeable, within a few feet. When the sand hills are at some considerable distance the sandy bottoms on that south side have the same quality as the soft waters in the sand hills—substantially the same.

5173 In speaking of the strongest water being under the first bottoms, I mean that it contains a higher percentage of dissolved solids. I gave no reason why that should be true. I believe it be due largely to evaporation and to the character of the material in which the water is found. The decrease of total dissolved solids is very abrupt on the south side. Where this abruptness does not come down close to the river it is more nearly like the north side; it is abrupt in every case, I mean to say, on the south side. The abruptness begins on the sandy bottom lands on the south side, even if the sand hills are two miles distant. There is a sandy catchment area, even though flat, for two miles, and the ground waters in that sandy district are very soft and are pushing under the river toward the north. There is a very considerable contribution to the ground water from the sand hills. This characteristic decrease of total dissolved solids that was noticed as you went back from the

5174 river on both sides was noticed as you went deep toward the level of the river, and the deeper you got the greater is the decrease. It is gradual and continuous.

Yes, sir, the river has a fall of 7½ feet to the mile through that part of the State, and the ground water has about a similar fall. On the north side there is a general tendency of the ground water to slope toward the river. In some places it is almost level on the north-and-south line. When it does slope toward the river it is about 2½ feet to the mile. There was one place where the slope was rather abrupt, about 8 feet to the mile at one point; at some points it was practically level, and that was true in the district just east of Sherlock on the north side of the river. It was nearly level north of the river for a considerable distance. For a distance of about eight miles it is practically level. There are slight changes.

5175 Yes, sir, I found some places where the ground water sloped the other way on the north side of the river. Well, we followed the ground water north in all cases until it began to slope to-

ward the north, and as to how far we went, well, that distance changed from 10 miles to 4 miles, and gradually changed. From 10 or 12 miles to 4 miles from the river it begins to slope gently to the north. As to what caused that slope to the north, well, there is another drainage line north of the Arkansas river. The channel of the White Woman creek is to the north and the land slopes to the north.

These comparisons that are made at the point designated in my cross examination as two miles west of the range line between sections 32 and 33 are due north from the river at that point. I understand the 1,120-foot well from the river at that point would be

1,120 feet from this well to the river channel. The river does
5176 run east and west where our stations were located. No, there

was no nearer point to the river than the 1,120-foot well, from that well. The river runs south of east and these distances were measured in that way from the river channel. I have an exact plane table sheet which we made, showing every curve and slough and everything else at that point from which we took those measurements. The well measuring 1,120 feet is practically at right angles from the river channel, but north in a general direction, of course. When I said that the 1,120-foot well was due north I was speaking generally and did not have that point in mind. The 2,500-foot well was that distance from the river channel at the nearest point regardless of directions.

5177 At that point, where the well two miles west of the range line crosses the river, the direction of the current of the underflow was 94 degrees east of north at this point, and the direction of the river channel is 100 degrees east of north. As to what that means, I will say that would be 90 degrees east of north. The average direction of the motion of ground waters, the direction of the flow, is 4 degrees south of east, and the channel of the river is ten degrees south east. The current of the underflow is nearer straight east than the channel of the river by six degrees at this point. The slope of the level of the ground water on the south side of the river to the east is the same as it is on the north side. The slope toward the river is very uniform and about 2½ to 3 feet to the mile. As to how far back this goes, our observations did not extend very far into the sand hills, on account of the lack of wells and the difficulty

in sinking wells, but it varied from 3 to 5 miles from the
5177 river. The underflow was nearly on a level with the river

south of the city of Garden. At one point south of the city the slope toward the river is only about one foot to the mile. No, sir, I did not find any place on the side of the river anywhere where it slopes from the river.

I am familiar with the article prepared by Willard D. Johnson and published in the Geological Survey. My recollection is that he has some maps that indicate that at some places the slope is from the river on the south side at distances from the river greater than we are talking about. I presume we would have found places where

the ground water slopes from the river on the south side if we had pursued our investigations back farther from the river, if his observations are correct, but we were not searching for that at all.

5179 No, sir, I was not making these observations for the purpose of giving testimony in this case, but they were made for the purpose of establishing the advisability of pumping water in that valley for the purposes of irrigation, so I do not know what we might have found that would have been of value in this case if we had been able to pursue these investigations farther south of the river.

As to the questions that if the river should flow bank full, whether the ground water in the strip I have referred to would be raised, I should say it might be raised if the river should flow bank full, because for a short distance on the north side of the river the ground water is lower than the level of the flow of the water in the river, and if the river should practically flow 2 feet deep the year round, although it might be low at some particular time of the year, this level of the ground water might be raised.

5180 I know nothing about how the river flowed in the earlier years prior to 1890, and I made no investigations and have never attempted to prepare myself upon the facts concerning the flow of the river prior to that year. If the river should flow practically ten months out of the year with a good, substantial flow, from one to two feet deep, I expect that flow in the river would contribute to the raising of the level of the ground water near the river. It could not exceed the increased height of the water in the river. It could not exceed, then, the contribution of about one-half of a second-foot to the underflow. I mean that if the rise of the water in the river did raise the water everywhere to the level of the water in the river the strip within which that rise could take place is so limited that the total of added underflow would amount to a continuous flow of one-half of a cubic foot of water per second of time, or 425 gallons per minute for the entire space that is below the level of the

5181 river. If the underflow should rise one foot for a number of miles down the river, it could not add more than one-half of an acre-foot per second or 225 gallons per minute in any case; otherwise it would have to flow on top of the ground. This rise could not extend back as far as a mile. If it did extend back as far as a mile, yes, it would be a third of a cubic foot over every square mile, as far as water is concerned. In other words, it would be

5182 one-third of twice as many feet as there are square feet in a square mile, because the gravels will not average over one-third of open space, and the gravels occupy about two-thirds of the volume and the water about one-third.

I do not know anything about a lake or pond that would be right south of Garden City and between that and the river. I made no investigations of that at all. Where I spoke about ponds being dried up in Wisconsin, I was saying in Wisconsin there is no ditching, and there is no ditching in South Dakota where the drying up of the lakes has occurred. There is ditching, however, in Michigan and

in Indiana. I do not know anything about it in Ohio. I do not know anything about the conditions in those States as to for-
5183 ests having been cut off and the land being cleared there.

Yes, sir, I stated that somewhere near two-thirds of the amount of the ground water for the narrow strip which I referred to came from rainfall and about one-third from the river, and I stated that if we could install the system that we were directly interested in I did not think it would affect the amount of water 7 miles below that at Garden City, and I think the amount that we would take out would be supplied by the original supplies of water and by the lessened evaporation. If we pumped up a thousand gallons of water 7 miles above Garden City the original supply would immediately reinforce that thousand gallons. So I think that the taking of the water according to our plans and system for a pumping plant would not affect the level of the water more than 7 miles away.

5184 I made cross-sections at Wichita and at those points and have several scores of analyses of the water north and south of the river at numerous points. Perhaps I have a hundred analyses of water at those points. The principal line of levels at Wichita was run just north of the city, on a township line. The range and township numbers are not given on this sheet which I have before me. On the township line extending through the north portion of the city of Wichita we found the ground water there in general sloping toward the river, with certain depressions corresponding to two creeks on the west side of the Big river and a very marked depression on the east, due to the Little Arkansas river, and east of that the water slopes toward the valley of the Little and the Big rivers. Yes, sir, there is a space in between the Little river and Big river north of Wichita where it slopes toward the Little river. At this point the strip is about a mile wide and widens toward the north and extends north four or five miles, the main river then bending to the west. I don't know whether it ceases altogether or not. It certainly must become quite inflective. But that
5185 condition exists as far as our observations went. On this township line the Little river is fourteen feet below the Big river. I have no levels north from there as to how it is. The Little river does not feed the Big river, because it is lower than the main river. I don't know how much of a contribution is made in there by the Big river to the Little river. The strip between the Big river and the Little river is—the ground water in that stip is substantially the same in character as the water in the Arkansas river for a mile or a mile and a quarter between the two rivers at this point in that strip, from a chemical standpoint. The waters are sub-
5186 stantially the same in that strip. As to what that shows, it is very strong evidence that the ground waters in that strip are being contributed to by the seepage from the Arkansas river. These direct chemical tests are restricted to three lines of observations. Here is this principal line, and there is one other line about two miles north of the first, and as to the third line, the three divis-

ions I have made are the ground waters near the principal lines of levels northeast of Wichita, and those southwest on the same line, the other side of the river, and the line below the city, down-stream from the city, south of the city. Those are all. No, sir, we did not have the same conditions existing in all those different places. The ground waters are entirely different in character from the river water everywhere except in that narrow strip between the Big and the Little rivers. The Big river at this place runs enormously high in common salt, and the total solids of dissolved matter in the river water is very high, being nearly 225 parts for a hundred thousand, running especially high in common salt. It is very different from the water of the river at Kinsley, Dodge, or anywhere else west as far as my observations have gone. The salt region practically begins about Sterling and ends some miles below Hutchinson, I think. On the west side of the river along there by Wichita the ground water slopes toward the river, about 10 feet in five miles, or 2 feet to the mile. This is on
5187 the main line of levels, west of Wichita, made at right angles to the channel of the river, above town, passing through this same township line. There are two depressions there which are not named on this map that I have, on the west side of the river. Yes, we found the old slough on the west side of the river; the Big slough and Cowskin creek are the names of those depressions. I don't know what the direction of the current of the underflow along there by the Big slough was. I made no measurements of the underflow there, and I cannot give the rate nor the direction. I did not make any investigations or measurements of the rate or
5188 the direction of the underflow at Kinsley, nor at Dodge, but at Dodge I made the first determinations I ever made in 1901. I found the rate there in the channel at Dodge, one determination only, to be three feet in twenty-four hours. That was made in 1901. The river had been dry then for many months. No, the river being dry does not have any effect on the rate of the underflow. When we made our measurements at Garden City last summer it was reported that the river had been dry for a great many months, including the last winter. I think there had been no water in the river since the previous fall. If the river had been absolutely dry from the State line down the river to Dodge from August, 1903, to the first part of May, 1904, I do not think that would tend to lower the underflow. There is a strip where the ground water is
5189 below the bed of the river. It usually dries out for a distance of 18 inches below the bed of the river and remains that way. If between August, 1903, and May, 1904, the river had a good, substantial flow practically all of the time, that would not have tended to raise the underflow only for a short distance back from the river. It would probably for a short distance north of the river, but not to any distance south of the river.

As to the ditch for irrigation purposes that was dug down at Dodge and dug down into the underflow, which lasted for some

years, I have investigated that matter. That ditch became dry for two principal reasons. One reason was that it filled up by overflow in the river. A flood in the river overflowed and washed in a lot of mud and stuff into the natural channel, and then it would fill up of its own accord, and did fill up, where it was not filled up with the wash from the river. It was filled up by an upward movement of the gravels. A so-called underflow ditch at that point was
5190 excavated some feet below the bed of the river (objection by defendants) and would have water in it if its bottom could have been held down. It would have had water in its upper end when the river was high. It could not have water in it at the lower end.

I know nothing about the statement that when Garden City was first built the cellars were either damp or had considerable water in them. If that were true I account for it by changes that have been made in the settlement of the country, because that ground water in the city is higher than the highest water in the river. I presume it was higher than the highest water in the river at the time the city was built. Yes, if those cellars have since gone dry there has been some change in the level of that water. Yes, if in the city
5191 of Wichita when the city was built first in the '70's and for fifteen years afterwards the cellars could not be dug in the city because of the presence of water so near the surface that the cellars would fill with water, and that within the last ten or fifteen years that water has gone down so that anywhere in the city of Wichita you can dig a cellar and have it dry, that would indicate that the level had gone down.

I know nothing about the rainfall throughout the whole valley not having perceptibly changed in the last thirty or forty years. I simply have the official records of the rainfall. I think the rainfall at Garden City is some five inches more than at the State line, and is about 20 inches a year for the number of years it has been measured. I know nothing about the rate of the current of the underflow at the city of Wichita or near there.

Cross-examination on behalf of defendants.

By Mr. DAWSON:

5192 The photograph marked Intervenor's Exhibit 3 is a photograph of a model prepared by me for the purpose of showing in graphic form the relative position of the ground water and the water in the river as affected by floods in the river and rain in the section covered by the investigations in that immediate locality to which I have referred in discussing the photograph. The top line shown by a thread strung over the cards is for the purpose of illustrating or showing the height of the water in the river from a fixed point taken as a base of measurement from day to day for a period extending from the 18th of June to the 11th of July, 1904; and the next line, or the one below that, is for the purpose of showing the level of the water in a given well sunk 400 feet north of the river during

the same period; and the third line illustrates the level of the water in one certain well sunk approximately north of the first well at a distance of 1,120 feet from the river; and the fourth line shows the level of the water in a certain well sunk north of the other two wells mentioned, and 2,500 feet from the river for the same period of time as that last mentioned.

Referring to the first line in Intervenor's Exhibit 3, when the line goes up over the higher cardboard, that shows a greater elevation of the water in the river in a flood period, and when it goes
5193 down that shows a less amount of water in the river, and the amount of increase or decrease is shown proportionately by the elevation of the line; and the same is true of each of the other lines as to the level of the water in the particular well which the line is given to represent. The card lying flat in front of the lines shows in figures the various dates opposite the uprights cardboards, and the black marks on the card show a given amount of rainfall on the dates where they appear, and the amount of rainfall can be determined by the number of lines which the black marks cross, each one representing one-fifth of an inch.

It appears from this exhibit that there was practically no effect shown in the well 2,500 feet from the river by reason of any change in the depth of the water in the river. It also appears from said exhibit that there was little if any change shown in the well
5193½ 2,500 feet from the river because of any rainfall in the country. I account for the fact that the well 2,500 feet from the river shows less effect from rainfall than the wells 1,120 and 400 feet from the river because of it being a much greater depth from the surface of the ground to the water at that place, and in addition to that, at the rainy period we pumped heavily from that well with a gasoline engine. The photograph, as to this 2,500-foot well, as to the period of rainfall, might not show the true condition as far as the July dates are concerned. We were pumping from that well on June 15, 24 and 27 and on July 5 and 6, but I do not think this pumping would interfere with anything which might be shown by the exhibit as to the flood of the night of June 21 and 22, and so far as the flood effect upon the well 2,500 — from the river is concerned, I think Intervenor's Exhibit 3 correctly represents the facts. The well 1,120 feet from the river did not at any time show any effect from the flood in the river, in fact the level of the water
5194 in this well 1,120 feet from the river, as shown on the exhibit, continued to fall during the period the river was under flood and for some time thereafter. The ground water does feel some influence from a rise in the river, as I have said, at a distance of 400 feet from the stream.

Speaking generally of the river through Kansas and excluding special or peculiar spots, I would say that this ground water would show some influence from 400 to 1,000 feet from the river on account of a rise in the river. That is, a thousand feet is about the distance from the river that the rise or fall of the water in the river will

affect the level of the ground water. That distance is a fair maximum for western Kansas, I should say. The amount of water which would be furnished by a rise as shown in Intervenor's Exhibit 3 extending back from the river 2,500 feet, that is, a strip 2,500 feet wide, would be one-half of one cubic foot per second of time; that is, a strip 2,500 feet wide on the north side of the
5195 river; and to get this amount I estimated it on a rise of 3 feet in the river level throughout the entire distance of 2,500 feet, but as a matter of fact I at no time found the river making that amount of rise, even back to the 400-foot well, and I found it making no rise back as far as the 2,500-foot well; but taking that as an arbitrary distance (2,500 feet) and 3 feet as an arbitrary height to which the water should be raised, the amount of water moving through the soil for that far back and with a depth of 3 feet would furnish a flow of one-half of a cubic foot per second of time. Assuming a rise of 3 feet in the ground water level, extending back 400 feet from the bank of the river, it would furnish about one-sixth of one cubic foot per second of time. I don't know whether a rise of two feet in the level of the water in the river would cause a rise of two feet in the level of the ground water back for a distance of 400 feet or not. The tendency at the present time is for it to fall or slope off as you go back from the river. The lowest point is
5196 north of the river. I think the rise in the level of the ground water within the strip which I have said is influenced by the rise in the river is due to two causes—first, by the water proceeding from the river into the ground, and second, because it furnishes a dam or back-water which raises the level of the water proceeding through the ground toward the river. I think both causes are present, of which the first is perhaps more marked than the other. I said that this well 400 feet from the river showed the effects of a rise in the river within about three hours. I did not mean by that to say that the water from the river proceeded through the 400 feet of soil within three hours. Such a rise can take place in perfectly stationary water. The increased height of the water in the river produces a pressure that is almost instantly transmitted through the water to a considerable distance, and
5197 a wave is set up in the ground water, which moves inward. It is not that the increased water in the river has gotten over to that well, but by pressure it has simply raised the water that was already there. I measured the rate of movement away from the river during that flood. I found that the rate of movement at the identical station at which it had previously been measured was about nine feet in 24 hours, and during the flood a second measurement was made, and the rate of movement was 9 feet in 24 hours, but the angle at which the flow was taking place was changed by about 43 degrees, away from the river channel rather than in the direction of the river channel. The method of the movement of this water may be fairly illustrated as follows: If you had a vessel which had two openings on opposite sides, with the water extending up into that as

pipes extending from the body of the vessel, and you placed something in one pipe or at one side, it would immediately make a rise in the water at the other side.

From the chemical tests of the water which I made, I found that the water in the river was softer than the water north of the river, and its temperature was very much higher, which indicated that the strong ground water was not a contribution from the
5198 softer ground water. In the second bottoms or uplands I found that the water was much softer than the water in the river; that by the time the second bottoms were reached the waters became softer and reached their greatest softness on the uplands.

Q. Then if these waters on the second bottoms or uplands came from the river, this could not be true if they had to proceed through the first bottoms which had the harder water, could it?

A. It could not be true.

Speaking of the slope of the ground water as compared with the slope of the river, the slope of the ground water to the east is practically the same as that of the river; that is, it slopes with
5199 the river to the east, and it also slopes generally toward the river, not from the river. It is perfectly possible from this that the ground water might have what would be called two movements—a movement with the river and a slight movement toward the river. It is a fact that our measurements if classified with the measurements of the north side of the river—that the direction of the flow north of the river will cross the channel of the river and those taken on the south of the river to an even more marked degree will cross the channel of the river. The experiments, taken as a whole, show very slightly that the movement is with the river and toward the river. The strong indication is on the south side only. Some of the wells as we went north from the river, that we investigated, showed a lower level of water than the wells between those and the river. This was after we crossed the divide and were going into the drainage of the White Woman. The level of the
5200 ground water, generally speaking, has something in common with the level of the surface of the ground, on the north side of the river, but it does not match it very accurately. It is true that where you find the country falling away, to the east we will say, as the Great Plains do, we will also find the water falling away and with a movement in that direction. In the locality about Garden City, as we proceeded back from the river to the uplands and reached the divide between the Arkansas and the White Woman, the level of the water at the divide was higher than the level of the water in the river or in the White Woman, and on one side of the divide it slopes to the east with the river and slightly toward the river and on the other side it slopes with the general fall of the country to the east and toward the White Woman.

5201 Q. If it be true that the Arkansas river in its natural condition, before touched for the purposes of irrigation, was a stream which had water in it through western Kansas for only a

part of the year and there were months in practically every following year when there was no flowing water in it, then in your judgment would that stream under those conditions have furnished any such amount of water to the ground waters of the country through which it travelled as would be of any practical benefit for any purpose? (Objection by complainant.)

A. I would expect under those circumstances to find the ground water under the same conditions as it is found at present.

That is, so far as the river has any influence upon it. I made some investigations about Deerfield. This is a town about fourteen miles west of Garden City and seven miles west of Sherlock. I have a diagram that shows the influence of flood and rain as observed at this point, but no model or photograph. These observations at Deerfield were made from August 4 to August 11, 1904. The level of the water in the river was observed continuously, and also
5202 in three test wells. Two test wells were located 1,100 feet from the river, one of them being 1,000 feet up-stream from the other. There was also a test well located 1,730 feet from the river. Three-quarters of an inch of rain fell on August 4 and one inch of rain fell on August 5. All three of the test wells showed a rise in the water plane due to this rainfall. The observed increase in the height of the water was about the same in all of the wells and showed that at least sixty per cent. of the rainfall reach the ground water level. A flood came down the river on the afternoon of August 7. The test wells were observed very carefully during this period of flood, but no material change in the level of the water in the wells took place while the river was in flood. The test wells were observed until noon of August 10 and the river was observed until noon of August 14.

Q. Did any of your investigations in this locality show the comparative level of the ground water and the river water as to whether one was higher than the other or not?

A. The level of the water in the test wells was lower than
5203 that of the water in the river.

And yet no effect was shown by the flood.

In the various instances in which I have spoken of the level of the water in the river I refer to the surface of the running water in the river.

Referring to the level of the ground water about Garden City, I would say that I never made any special investigation of it in that locality, but from my general knowledge of the country and the subject I do not think there is any necessary relation between the lowering of the level of the ground water in Garden City, if it has been lowered, and the river, because the level of the water in th city is higher than that of the river, and being higher, it could not draw its supply from the river.

5204 In referring to charts, I find that the water in the city is not higher than the water in the river. I was mistaken in regard to that. In one part of the city it is and in the other it is

not. The same conditions which have caused the lowering of the level of the ground water over large areas of the United States might have caused the lowering in Garden City independently of the river. (Objection by complainant.) The building of sewers and the laying of sewer pipes in the drain ditches that were cut for them might in itself lower the ground water level throughout the town if the sewers were laid below the level of the ground water.

Q. You spoke of South Dakota and of having noticed a marked lowering of the ground water level in that State. Was that in the immediate vicinity of the rivers or where it was uninfluenced by river conditions?

A. It was remote from the rivers, between the valleys of
5205 the James river and Missouri river.

And there was no irrigation in that country at all.

The same is true as to the places observed in the State of Wisconsin where I stated there was a lowering of the level of the ground water. These places were remote from the rivers.

We found numerous wells existing in the neighborhood of Wichita between the Arkansas river and the Little Arkansas. We did not sink any wells. From these wells we found the water level sloping from the Arkansas river to the Little river and then sloping from the Little river upward to the northeast through the city of Wichita, cutting off the drainage of the city from that of the Arkansas river. These wells that I examined were on that bit of land which might possibly be termed the delta, between the two streams, where
5206 they come together. I have no evidence one way or the other as to whether the conditions on this strip of land investigated were abnormal; that is, I do not know whether this delta at one time might have been or not the old river bed or whether the two streams might have come together at some period, farther up.

The reason for the slope from the Big river to the Little river, of the ground water, is that the Little river has eroded a channel which, as I stated, at this point is about 14 feet deeper than the bed of the Arkansas river, and the Little river is a clear water stream while the Arkansas river is a muddy stream. Having eroded to that extent, the Little river in a measure acts as a drain for the country lying between the two and draws the water, because of its being lower, from that section of ground lying between it and the Big river, and that in a measure accounts for the fact that the influence of floods, for instance, in the Big river, or of any flow of water in the Big river extends farther from the banks than it does at points farther west on the stream.

As to the amount which a strip of land a mile wide such as you find there between the two rivers would carry in cubic feet per second of time, and assuming the same kind of soil as you have in western Kansas—which is a very generous assumption because as you go down the stream you would expect to find the sand
5207 finer—and with a slope of 14 feet to the mile, and with a

depth of water of say three feet, each mile would furnish about two second feet, that is, for each three feet in depth.

5208 (Objection by complainant.) I could give a better judgment as to the flow of these waters from the character of the waters and the beds of the rivers. The character of the water in the Little river is very soft; the water in the Big river is very hard; showing that the contribution is not a large per cent. of its flow. It is about one-fifth of the strength of the water in the Big river.

Q. From your investigations in western Kansas, about Garden City, could you give us any notion as to the value of the low water flow, that is, when the Arkansas is running a very small stream, as it has been testified it often does, to the ground waters? Does it have any perceptible effect on them, say when it is running a stream thirty or forty yards wide and six or eight inches deep?

A. We have detected no influence upon the direction and flow of the ground waters during the low stage of the river.

5209 During the low water flow in every case of observation—and we made several—a test hole put down in the running water showed the ground water beneath the bed of the river to be lower than that of the flowing water in the river, showing that at its low stage the bed of the river is almost impervious—silted badly with mud.

Q. During the low water stage does the river throughout gain any benefit from the ground waters, or is the converse true, that the ground waters gain from it?

A. Speaking of the district which I have been discussing, from Garden City west to Hartland, I am very sure there is no contribution from the ground waters to the flow of the water in the river.

Q. Does it contribute to the bed of the river—that is, does the water so proceed from the outlying lands toward the river that it is taken up by the sands if not by the flowing stream on the surface of the river?

A. Very slightly that is true. It is a very minor matter.

That is very largely because the motion to the east is so greatly in excess of the motion toward the channel. It may contribute more extensively to the river farther east, but I do not know anything about that.

5209½ I made some investigations of ground waters west of Garden, near Sherlock, of the same character as those about which I have been testifying. Sherlock is seven miles west of Garden. From these investigations I prepared a model on the same general lines as Intervenor's Exhibit 3, except that it shows both sides of the river. Intervenor's Exhibit 5 is a photograph of a model I made, taken from the north side of the river. Intervenor's Exhibit 6 is a photograph taken of the same model as shown in the previous photograph, taken from the side that represents the district south of the river, near Sherlock, Kansas. Taking these exhibits, the top of each cardboard corresponds to a cross-

section of the water plane taken across the valley on a
5210 certain date, the right side of each card corresponding with the north side of the valley and the left side corresponding with the south side of the valley. The location of each test well is shown by a vertical line, and the position of the channel of the Arkansas river is indicated by the level segments of each cardboard near the middle of the sections. The model shows to the eye the way in which the level of the river and the level of the water in all the test wells gradually fell from July 13 to July 27, and it also illustrates the influence of a flood of July 27 upon the wells near the river. It also shows that the level of the water in the test well one-half mile south of the river was not influenced by the flood in the river, but continued to fall during the entire period. It also shows that the flood of July 27 affected the level of the water in the test wells located 500 feet from the river and to a much less degree the level of the water in the test well located 900 feet from the river. The test well located 1,700 feet north of the river was not observed during the period covered by the photographs, but a measurement of the direction of the flow of the underflow waters immediately following the flood in the river showed that the direction of the flow was parallel with the channel of the river and was not diverted in the direction of the flood in the river. Similar determinations of the velocity of the flow in the well 900 feet from the river, made while the river was in flood, showed that the direction of the flow was slightly away from the main direction of the river chan-
5211 nel. The direction of the underground flow is sometimes determined by the character of the material in a given direction; that is, while the general trend of the flow might be toward the east, at some given point it might vary from that on account of the less difficulty in getting through certain material that was in the natural line of flow; yes, sir; so that slight variations in the direction of the flow are not necessarily of any particular significance in determining the general movement of the whole of the ground water. A single determination is not of very great value.

There are a great many reasons that lead me to believe that the pumping plant heretofore referred to will not affect the supply seven miles below. One of the reasons is the very favorable catchment area from which we draw. The rainfall upon a township of land in our catchment area will supply the water we take out. This is not an estimate but an actual determination of what the rainfall contributes to our catchment area. Part of the work was to determine how much water entered the catchment area we proposed to use.

5212 Q. Do you know of any reason why that Dodge City ditch about which counsel for Kansas asked you would not have water to-day as it formerly had if it were in the same condition it was in when it had water?

A. Yes. The underflow ditch at Dodge never did carry its flowing waters for any great distance, because it ran over very coarse

beds of gravel, of necessity, which absorbed the water at one end as fast as it could be taken out at the other. The conditions were impossible for carrying the water over that coarse material.

Q. But as far as it formerly did have water, if it were in the same condition it was in when it was first built, ought it to have water now?

A. It would have the same water as it had, yes.

I have had a good deal of experience besides that which I have testified about in the Arkansas valley in determining the direction of the flow of ground waters and the rate of flow.

Q. I want to ask you, Proffessor Slichter, whether a test of this kind would be of any particular value in determining either the direction or velocity of the flow of the ground waters: If parties in Wichita sank four wells, one at each corner of a square, twenty feet apart, and then sank a well in the center of the square and put aniline dye in the center well, and then manned each corner well with a pumper and commenced to pump, and out of one well there appeared the coloring matter before out of another, would that be any safe test as to the direction of the ground flow and its velocity?

5213 A. As you have described it, it would be a perfectly worthless experiment as far as determining the velocity or the direction of the ground water is concerned. As I understand it, a man at each corner was pumping simultaneously at a uniform rate.

Q. I will ask you if you have not had an opportunity and if you have not read either in the evidence or an abstract of the evidence of the experiment which was introduced by the attorneys for Kansas to show the direction of the ground water flow in Wichita similar to the example which I have just given you in my last question. (Objection by complainant.)

A. Yes sir.

Q. You said that you have read something of that kind. Do you consider that the test described in the evidence in this case which you say you have read is an adequate one for determining either the fact of flow, the direction of flow or the velocity of the flow? (Objection by complainant.)

5214 A. I would not regard that as an adequate determination of any of the facts which you have stated.

Q. Can you give some of the elements that are left out in the test as outlined in my question or as stated in the evidence which you have referred to that are lacking to make it a trustworthy test for the purposes named?

A. Everything that would be essential to such a test is lacking in that test, because by your statement the natural level of the ground water is being disturbed by pumping, and the normal rate of movement of ground waters is slow. The artificial rate that was introduced is of necessity much higher, and the direction of least resistance between two of those wells would be taken by the aniline dye, even though the direction of the flow of the undisturbed ground

water was directly opposite to that. The moving ground waters average up in their motions the resistances presented by various deposits over wide areas, while with the pumping that was done in that case every little local inequality would have an enormously exaggerated influence upon the local direction of the flow.

Q. Difference in pumps might make some difference, might it not? (Objection by complainant.)

5215 A. It might.

Q. The difference in the strength or speed with which the men worked might make a difference, might it not? (Objection by complainant.)

A. It might make a difference. It might not be nearly as great as the enormous differences that exist in every deposit of sand or gravel from foot to foot.

My investigations about Wichita did not disclose an abundance of soft water. I did not test it for its sanitary qualities. The hardness could be accounted for by local conditions there.

5216 We made some investigations of a stream called Bear creek in western Kansas, near Hartland, where there is a depression, which is the dry channel of Bear creek. That stream does not flow at this point, and as far as I can determine from settlers it never has been known to flow at the point where we made the investigation. It is a stream which has not been observed to reach the Arkansas river. It has been observed to reach into the sand hills. When it reaches those sand hills it sinks into the sand. I don't know whether the waters of Bear creek, both in normal and flood times, go to supply the ground waters of Kansas. I only know that at this point where there is this dry channel in Bear creek the direction of the flow of the ground water is in the general direction of the Arkansas River valley, and if the waters of Bear creek sink into the soil there at that place they must necessarily augment somewhat the ground waters in that locality, and they do.

Q. You know nothing about the general flow of the Arkansas river and the effect of irrigation upon the return waters, and matters of that kind?

A. I know nothing about those matters at all.

5217 The general laws of the movement of ground waters are now thoroughly well understood by investigators, and while I have been testifying in regard to particular instances and investigation, those are simply instances which fall within the general rules covering the flow of ground waters; and while the rate of flow might be greater or less in other places or localities, yet for the character of soil through which this ground water flows in western Kansas, taking into consideration the fall, the estimates which I have given are accurate determinations. They are not guess work at all.

As we proceed farther down the stream in Kansas the slope of the ground water changes. (Objection by complainant.) We found the slope of the ground water at Wichita to be about five feet to the mile; in the western part of the State it is about 7½ feet to the mile

and at Kinsley about 6½ feet to the mile, and as a general proposition the sand becomes finer and the gravel smaller as you proceed down stream from its head.

5218 Speaking of rainfall, the proportionate run-off increases very rapidly as the annual rainfall of the same character increases; but to determine the increase would require a special table for each locality.

Q. But taking the same locality or the same ground conditions, a rainfall of thirty inches per annum falling in the same manner would furnish much more than double the amount of run-off that a rainfall of 15 inches would furnish?

A. Yes, it would, under identical ground conditions—slopes and everything. It is not as simple as that by any means.

Q. But the valley of the Arkansas in eastern Colorado and that in western Kansas and down in the middle has many characteristics in common, has it not?

A. I think the characteristics of the intermediate region differ from both of them. The region around Garden I think differs quite a little from that in the eastern part of the valley and from that in the western part. I should say the differences were greater than the resemblances, so far as run-off is concerned. I think there is more run-off in Colorado. I will simply say I know there is no appreciable run-off around Garden, from observation. As we

5219 proceed farther east in Kansas I know there must be a run-off there on account of the floods following the rains. I haven't investigated in any way. In the eastern part of the State we know that the streams are perennial and that there is run-off, on account of the indications of erosion everywhere. I know of no perennial streams in western Kansas except what we call the Cimarron; that is a perennial stream—if you call that a Kansas stream. It is partly in Oklahoma.

Q. Could you call the Arkansas in western Kansas a perennial stream?

A. It is a torrential stream.

Cross-examination on behalf of the complainant.

By Mr. ASHBAUGH:

I think I made two statements in answer to questions propounded by counsel for the State of Colorado, yes, sir, that during the flood the waters flowed at a greater angle from the river than when there was no water in the river. That is true at the stations near the river. I gave the angle of change at the station 300 feet from

5220 the river; 43 degrees difference; that is, 43 degrees farther away from the direction of the channel during the flood than when there was no flood. I think that the date of that flood was August 7th. Yes, sir, I had one well at 1100 feet and one at 1,730 feet, both on the south side of the river. There was another one 1,100 feet from the river, but 1,000 feet up stream from the other

one, making a triangle. Yes, sir, the level of the water in those wells was below the river. No, sir, it did not at that point slope from those wells to the river.

I will have to change my statement about the elevation there, because these wells were not in line and the elevations in the river were taken at the bridge and one well was below the bridge and one above the bridge. Well, two of the wells were below and one above the bridge, so I cannot state without looking at our orginal data the exact difference in level, and the indications are that the ground water level there is higher than the level there and not lower.

The absolute values I gave of those test wells are lower, but
5221 being down stream from the position at which the level of the river was taken, so that does not signify that they were absolutely lower. The level in the test wells was not necessarily lower than that in the river.

In determining the level of a well from the river, yes, it depends upon the point of the river that you make the comparison with. It should be taken at right angles with the river channel. These that I have given are at right angles. Oh, yes, if any water went from any point in the river into any of these wells it would go from the point from which you make the comparison. It would go in the direction of the slope, and that is the direction of greatest slope during a flood—these wells being near the river—more particularly in that direction than in any other. A slight variation.

5222 Yes, I think that in some parts of Garden City the wells are below the level of the river. The slope would be at right angles to the river channel. Some of them are lower.

During the flood of July 27 observed at Sherlock the river increased 4.3 feet and it affected the well 500 feet south of the river and produced a change in that well of 1.4 feet, about 51 hours after the flood. The flood began at eleven o'clock in the morning. At night this well had shown an increase of .2 of a foot—almost
5223 nothing—and the next observation we have of that well that is recorded in this table is at 8 a. m. of the 29th, and then it had risen 1.3 feet. That evening at 7 o'clock the maximum of the flood—its maximum was at 5 p. m., of the flood, that is, the maximum on the 29th. The flood began at 11 a. m. on the 27th and the observation was at 8 a. m. on the 29th. That makes 51 hours. The rise, then, reached its maximum in the well 51 hours after the flood began. I cannot tell how much it had risen in 24 hours. At 7 p. m. there was a rise of nearly .02 of a foot, 8 hours after it began. Perhaps that is pretty long, because it raised gradually, and the maximum was at 5 p. m. That is only two hours after the maximum. The rise in the 500-foot well was observed hourly during the flood. It was observed every hour and every half hour.

5224 At one o'clock p. m. there was no change. At 3 o'clock p. m. it had arisen .1 of a foot. At 5 p. m. it had risen nearly .3 of a foot and at 7 p. m. it had risen .5 of a foot, and it reached its high-

est about 2 o'clock on the morning of the 28th; that is, we observed all through the night, hourly.

As to the 900-foot well, at its highest it had risen .7 of a foot in about 15 hours. As to the 1700-foot well, the direction of the flow at that point was not affected and observations of the height of the water in it were not made on account of the fact that the well was not finished when the flood came. I think the water in that well did not rise at all on account of there being no change in the direction of the flow. I do not know how long the flood of July 27th lasted, because it was still in flood when this record ends, on August 1. It had not receded completely. It was a very severe flood. It lasted more than four days, but how much more I do not know. It reached its height at 5 p. m. on the 27th. It fell very slowly.

5225 Q. There is a current to the underflow at the city of Wichita, is there not?

A. There must be, because there is a slope to the water plane.

Q. Then if the test that counsel referred to showed simply that fact, it was valuable for that purpose, was it not?

A. If it showed the fact?

Q. Yes.

A. I can't conceive that it would show that fact, however.

Q. It was not made by you, was it?

A. No, sir.

Q. When you speak of the Dodge City underflow ditch, you never saw that ditch until 1901, did you?

A. No, sir.

Q. And the ditch had then been out of existence more than 15 years, had it not?

A. I don't know. It was filled up at the upper end when I saw it.

Q. The ditch was dug in the early '80's was it not?

A. I don't know; I think so.

Q. About 1884, was it not?

A. I think it had been in existence a long time.

Recross-examination on behalf of defendants.

By Mr. DAWSON:

Q. You have been asked often as to the current of this underflow. Do the ground waters through Kansas where you made your investigations have a current or flow in a channel in the way in which we speak of the current of a river or the channel of a river?

5226 A. Well, the flow is in gravel—in sands—and not in caverns.

Q. Are not these waters what are commonly called percolating or ground waters?

A. Yes.

Q. The mere fact that they move in one general direction, coin-

cident with the general slope of the country, does not change their character from percolating waters and what is meant by that term, does it?

A. In my opinion, it does.

Q. In what way?

A. They constitute a drainage for the country that passes in a general direction for long distances without seeking a surface drainage channel.

Q. Well, I say, that does not alter the fact of their being percolating waters, does it?

A. Well, I make a distinction between percolating waters and waters that drain a country in this way, myself.

Q. What is the distinction that you draw?

A. The distinction I draw is is the distinction between waters that percolate towards a stream and form what we might call springs in the bed of the stream and waters that move on for considerable distances without seeking release or being forced to seek release in surface streams. I call one underflow waters and the other percolating waters.

Q. So far as the rapidity with which they move is concerned, these ground waters move no faster than what you denominate percolating waters, if as fast, do they?

A. No, sir, no difference in that respect.

5227 Q. None of these ground waters of which you have spoken are such as can be designated underground streams or water flowing in defined channels, are they?

A. They are not.

Q. Then at least to that extent they are percolating waters as distinguished from waters flowing in well-defined channels or streams either underneath the surface or on the surface of the ground, are they?

A. Yes.

Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

Intervenor's Exhibits 5 and 6 are correct photographs.

(Said exhibits were here offered in evidence.)

5228 The models which I have used in my testimony, of which Intervenor's Exhibits 3, 5 and 6 are photographs, are partially made of cardboard. The cardboards are mounted on a base of wood.

DENVER, COLORADO, April 11–12, 1905.

5232 ELWOOD MEAD, Denver, Colorado.

Direct examination on behalf of intervenor.

By Mr. CAMPBELL:

I reside in Washington, D. C., and am chief of the irrigation and drainage investigations of the office of experiment stations of
5233 the United States Department of Agriculture. I am a graduate of Purdue university in Indiana, of the class of '82, and a post graduate in engineering from the Iowa State college in 1883. I received the degree of doctor of engineering from the Purdue university in 1894.

After leaving college my first employment was in the river and harbor work of the Government as U. S. assistant engineer, with headquarters at Indianapolis, Indiana. My next employment was that of professor, first of mathematics and then professor of irrigation engineering, in the State Agricultural College of Colorado at Fort Collins. From 1884 to 1886, in addition to my duties at the college, I was assistant State engineer of Colorado, and during the summer months assisted in the gauging of streams and ditches in Colorado, and in 1888 I became territorial and afterwards
5234 State engineer of Wyoming, resigning that place in 1898 to take up the work I have now. For over twenty years irrigation has been my live work, and I have given it exclusive attention, not simply on the engineering side, but on its agricultural and economic features, the nature of my position requiring me to take up all phases of this question. On the engineering side, from the time I first became connected with the college at Fort Collins until I entered the service of the Government in 1898, I was employed more or less in a consulting capacity by irrigation companies in the planning of particular structures and laying out works as I could find time for it in connection with my other duties, and in that connection have designed irrigation works in half a dozen different States. On the administration side, the question of water rights was one that required attention with my duties as a professor in the college, and later in connection with my work as State engineer of Wyoming. Since I have been connected with the Government it has been necessary to continue those studies, because one of the lines of work outlined in the act creating this division in the department is that it shall make a study of the laws affecting irrigation and the rights of riparian proprietors. In addition, I hold the position of professor of irrigation in the University of California, and each season give a course of lectures on the legal and economic phases of irrigation generally, not in the
5235 technical sense but in showing the relation of irrigators to each other and the public in the utilization of water supplies. The performance of the duties connected with these official positions has compelled me to give continuous attention to the legal and eco-

nomic phases of irrigation, and that attention has been continuous throughout the entire period. In addition to the work outlined, I have made some study of foreign irrigation, and some personal observation also. In carrying out the work of the Department of Agriculture, which requires us to study the methods and institutions of irrigation not only in this country but in foreign lands, I have not only made one trip myself, but a number of members of my division have made, under my direction, personal investigations of the engineering, agricultural and legal questions connected with the irrigation systems of other countries. This included the study of irrigation laws and practices in Germany, Switzerland, France, Italy and Egypt, and, if Canada is to be considered a foreign country, of Canada as well. I have personally made an investigation of the Canadian laws and a number of the Canadian irrigation works. I have visited Germany, Switzerland and Italy, and am personally familiar with the methods of administering streams in those countries, and have read and aided in the preparation of a report on the other countries mentioned.

5236 I have prepared a number of official reports on the subject of irrigation, and am the author of a book entitled "Irrigation Institutions," published my MacMillan & Co. in 1903.

I was a witness before the Industrial Commission appointed by Congress in 1901. My testimony can be found in Bulletin 105 of the Agricultural Department. Among other bulletins which I prepared or supervised in the Agricutural Department in respect to irrigation are Nos. 58, 60, 70, 86, 96, 100, 124, 133, 144, 145, 146, 147 and 148 of the office of experiment stations, and there are a number of other bulletins that deal almost exclusively with irrigation practice; that is, from the agricultural side of irrigation.

5237 I prepared the original draft of the code of Wyoming which deals with irrigation in that State, which was passed with but very slight amendments. It was practically as originally drawn. It is my impression that those laws are favorably considered, from the fact that a great many of their features have been largely copied by the States that have subsequently enacted irrigation laws.

In my investigations I have been obliged to travel extensively over the whole arid region of the United States. I have been in all the States and Territories included in what is known as the arid region, and I have been detailed by the Agricultural Department at the request of the Department of Justice to assist in whatever way I could in this case so far as the Government is concerned. The reason that the Department of Agriculture has taken such an interest in this case and has detailed me to render whatever assistance I could to the Department of Justice, it was a courtesy

5238 to the Department of Justice, but also because of it being one of the duties of this office to make a study of the laws and institutions affecting irrigation. It was regarded as a part of the official duty of the department to become interested in this case and to become familiar with the issues involved. The decision in

this case may have a very important influence in the shaping of the subsequent agricultural development of the arid region. Yes, I have familiarized myself with the pleadings in this case and know the questions that are raised by them and that are involved in the determination of this suit.

Q. I wish you would go on and in your own way give your own view with respect to the questions that are involved in this suit.

A. I regard this suit as simply being one of the numberless evidences of the constantly increasing importance of water to the life and comfort of man; that this grows out of increasing population and advancing civilization; and that it is causing an evolution that is not only changing the industrial status of water but is pro-
5239 foundly modifying the legal principles which formerly governed public water supplies; and as that has something to do with my conception of this case, I believe it might be interesting to explain in some detail the nature of these changes.

In a primitive civilization, or where there is a scanty population, the uses of water are so limited that there is always an abundance for all necessities, and hence the conception that at one time largely prevailed, that water was one of the free gifts of nature that belonged to everybody alike, as does air and sunshine, did not need to be seriously questioned. So long as there was water enough for everybody, a statement of that kind was, for all practical purposes, correct; but as population increases, and especially as civilization advances, it has been found that this conception will not answer. Take it to-day, water is needed in nearly every branch of human industry. It is required to feed the steam boiler; in fact the inventions to utilize steam have at one stroke enormously enhanced the industrial importance of water. It is needed in chemical processes. Enormous quantities are used in varied industries. Inventions for the improvement of machines for the utilization of water and power have also increased both the utilization—the use—and value of water. The old water wheel has given way to new types of wheels that are far more efficient. The improvements in the transmission of electricity by which power can be conveyed from streams to distant points with very little waste or
5240 loss, and which furnish facilities for the division and distribution of that power, that were hitherto unknown or impossible, have tended to greatly augment the importance of water; but perhaps the greatest increase in its value, considering the world as a whole, has come from the increasing uses for domestic purposes. We can illustrate that by taking the conditions that exist on Manhattan island. A hundred years ago the question of water was one of the least in its immediate importance, so far as the health and comfort of its inhabitants was concerned, because the limited number of people on that island could draw all their water supplies from the island. They could get it from wells, or from the roofs of their houses, and the question of water supply for municipal purposes or household uses was of entirely

subordinate importance. To-day there is no question connected with the future welfare of that city that is of more urgent importance, or is destined to exercise a more commanding influence on the character of its future growth, both in the habits and the health and comfort of the people. The demand for water has grown so enormously that the serious problem is to find a water supply which will meet their needs and to obtain it. They are reaching out now more than fifty miles to obtain water supplies. They have had to destroy towns in order to remove sources of contamination, and a great many available streams which were formerly natural water courses have been completely absorbed and it is
5241 inevitable that additional streams must be absorbed in order to make these uses.

Now, that situation is not only apparent to the city but it is manifest from developments that it is also apparent to the shrewd, capable and unscrupulous business interests, and so perhaps one of the most stupendous scandals of recent years came from the efforts of a company to capture the sources of the water supply of New York city and compel the municipality to pay tribute to this corporation. Legislation was secured from the State that would permit a private corporation to condemn and acquire water supplies and gave to this corporation powers that were not possessed by the city of New York or any other municipal corporation in the State; and this dependence of a great city on a private corporation for one of its fundamental necessities was only averted through an outburst of popular indignation which led to the repeal of the measure and prevented the city authorities from carrying out an agreement that had already been drawn. I call attention to that occurrence or transaction because it shows that in many parts of the world water supplies are changing their character so that they are becoming one of the important industrial resources of the world and are being acquired and distributed and handled just as are other of the world's resources that have commercial value, like mines of coal and iron.

5242 Water has also a commanding importance in the development of the arid portions of the earth's service. In the arid region the ability to use streams in irrigation is an absolute requisite to the existence of any considerable degree of civilized life, and not only in the arid region but in many other parts of the world the existence of a pure water supply and the ability to use it is a necessity to the creation of wealth in land.

With this growing value of water and the growing necessity for water, there have come great advances in engineering, in the means of distributing and using it. Great improvements have been made in canals to lessen the losses from seepage and evaporation, and great advances have been made in the machinery for drawing it from beneath the earth's surface. Pumps are far more efficient than before. Not only have we improved the facilities for rendering it available and for distributing it, but in all parts of the world the governments

and individuals are engaged in efforts to economize in its uses and to cause it to render a greater service. The Government of the United States is annually expending large sums of money through the Federal departments and through the State experiment stations in efforts to promote more economical methods of applying water to crops so as to cause a given volume to render a larger service; and that is true
5243 of many of the European countries. They are doing the same thing. Private enterprise is also engaged in the same work.

Now, this evolution which has so enormously increased the value and importance of water has also increased the dangers from water in like measure. The influence of floods or of marshes on the comfort or health of the original inhabitants of the Mississippi valley is very slight, but when cities are built along the streams, when large sums of money have been expended in the improvement of lands, then floods often become causes of the loss of millions of dollars' worth of property and the sacrifice of many lives. Not only is that true of the ordinary operations of nature, but in these efforts to render water available great structures are erected, dams are built for the storage of water, and those water supplies held in that way above cities and towns become a menace to the lives and property of the people living below. In the same way, many areas have to be drained as a protection to the health of communities. Both on account of increasing values and on account of increasing dangers, we find as countries become more and more populous and civilization becomes more advanced it is impossible to leave water supplies to be utilized without some sort of regulation and control.
5244 The property becomes too valuable to leave it to be taken as individual interest or inclination might dictate, or to leave private interests or enterprises to the unrestricted management of these water supplies. And so we find that instead of water being a free property for everybody or an uncontrolled property that everybody could take sooner or later, it is passing under some sort of public regulation and control—either the control of States or of municipalities and communities.

These are the general features of a change in the status of water all over the world. I could furnish another illustration of this by calling attention to the fact that this change of status is shown by the remarkable growth in legislation over water in recent years. It was not until the middle of the last century that countries like Austria and Germany had any general code of water laws, and in both these countries those laws have been revised once or twice since, and in every instance this revision is in the direction of a larger or more rigid direction and control by public authorities in order to lead to more efficient use. In Switzerland up to 1902 water, while of great industrial importance, and with rights to it dating back to the time of the Roman occupation,—the regulation of water rights had been left to each one of the different cantons. Now, the whole of Switzerland is less in size than a Colorado county, and the
5245 division of that small area into 27 or 28 cantons, each with its own separate water rights and each with its own code of

water laws, had been a source of greater and greater friction and unrest and controversy, so in 1902 the federation enacted a law for the entire country, to apply to all of Switzerland. One would not regard that as important legislation, but it was the statement of many with whom I conversed about this that there had been no legislation in the last quarter of a century that had aroused such active interest and such strong feeling both for and against it. The origin of that legislation is of interest. All of the railways in Switzerland are owned by the State. The most profitable business of those railways is the hauling of tourists up and down the mountains. Those railways to-day are steam railways run by locomotives that burn coal. Switzerland has no coal supplies, and the expenses for fuel are a constant drain on their revenues, and it is a very large item of expense. Now, plunging down the sides of those mountains are cataracts that would furnish the power practically without cost to pull the trains up, but the government, because of the old existing rights and the possible interference with this utilization of power by the government, has not felt that it was in a position to make the change until there could be some definite legislation under which old rights, where they would be interfered with, could be extinguished and there could be some definite and final method of settlement of these rights.

5246 In Italy, which is generally regarded, I believe, as having the most efficient administration of public water supplies in irrigation of any country in the world, the foundation of the present administration was laid in the last century when the authorities of the kingdom declared all the public water supplies of the kingdom state property—public property. They are administered by the state; that is, the rivers are administered as a state resource. This water is treated as a valuable property, and administered as a valuable property. The government refuses to permit any diversions from the rivers without a permit, and in the granting of the permit it doesn't simply consider the first priority of application, but the relative benefits to be derived by the public from different applications. For instance, if A makes an application to-day and B makes an application next month for the right to divert an equal amount of water from that stream, it is not decided simply on the question of priority, but it is decided on which of the two diversions will return the greatest benefit to the public. Now, the exercise of that discretionary power is so important and so difficult, and so likely to be criticized, that the law which first placed the control of this water in one department—the department of public works—was amended at the request of that department so as to include persons from other departments of the government—the department of agri-

5247 culture, the department of war, etc.,—and in all there are five departments represented on the board which passes upon these applications. That is, the water has become so valuable, and the uses that can be made of it are so profitable, that one depart-

ment did not want to be subject to the pressure that was manifested in these applications.

Now, similar illustrations might be made on the trend of the laws and the administration of streams in all of the leading countries of western Europe. The same causes are operating in England. Originally, in England the conception of the water course—its chief utility was to carry away the surplus water supplies. It served as an outlet or drainage. The conception of water as a commodity, valuable in itself, was not supported by the conditions in England; but one of the most serious questions that confronts industrial England to-day is to devise certain means under their laws by which the growing cities can obtain adequate water supplies. This is true of Birmingham and Manchester, and it is especially true of London. The enormous growth of London, and the enormous increase in the consumption of water, and the difficulty in obtaining pure water supplies to meet that consumption, has been one of the most serious problems which has confronted that city in the last twenty years. In order to do this they have gone to the chalk hills, where the water is pure—I don't remember the exact distance; it is
5248 about an hour's ride—and have drawn very largely on the underground supplies in that section of the country. And they have drawn on those underground supplies to such an extent that two streams of considerable size have been entirely absorbed, and two years ago the city of London was engaged in litigation over the destruction of those streams and the interference with the natural water supplies of the villages along those streams.

That action, forced by necessity, is in direct violation of the doctrine of riparian rights, because the right of the riparian appropriator, under the English common law, was an inseparable attachment to the soil along the streams—an inseparable right. But not only have individual rights been taken but all rights along certain water courses have been destroyed because of the superior necessities of a great city.

There is no single country in the world where the use of water in irrigation has reached the extent or is of greater importance
5249 than in India. It not only involves the diversion of an enormous quantity of water, but the right to make those diversions affects the lives of millions of people. The amount of money that has been invested is beyond computation; it has been going on for centuries and it is impossible to tell how much money has been invested. There is one illustration that would give some idea of it—that the amount of water that is lifted from wells there, from underground supplies alone, is greater than is used to-day in the entire United States. There is more land irrigated from wells than is irrigated in the United States to-day. Now, the most significant feature of irrigation in India is the fact that within the last hundred years the character of the development has changed so that it has enlisted the interest of the government in promoting and securing a more efficient division and distribution of the water supply, and the gov-

ernment to-day is carrying that interest farther in promoting a more economical use of water. There were representatives of two of the divisions of the Indian government here last year studying our methods of applying water and of providing water by pumping. They visited Colorado, Utah, California, and spent several months in studying our methods, their purpose being to promote the larger use of the water, so that a given volume would render a larger service.

5250 The English government has been making appropriations for irrigation enterprises in India, and it was always with the idea of preventing famine. The conditions in India are such that the prevention of enormous losses of life in seasons of drought can only be brought about by increasing the irrigated territory in those cases where the water supply is already utilized; then they are up against this problem—that the only way they can increase production is through more efficient use of water, and that is the real reason why they are making these studies in other countries.

Oh yes, the Federal Government in its policy of erecting reservoirs in the arid region is to a certain extent imitating England in the erection of these tanks in India. The tank system of India is very old. Now, what the British government is doing, it is not only taking up that work but is restoring many of the old tanks

5251 to their former conditions of usefulness. This tank system in India involves an enormous capital in the aggregate, running up, I suppose, into hundreds of millions of pounds. I would say that in Egypt the development in recent years has been more rapid and more significant in a comparative sense than it has been in India. It is also under the direction of the English government and is for the same purpose—the improvement of the condition of the people living there. That has been brought about first by the completion by the English government of diversion works

5252 begun by the French government at the time it had control of the country, by which it was made possible to utilize a much larger percentage of the flow, and the recent construction of the Assouan dam, that serves both purposes—storage and diversion. Within the last thirty years it is probable that the irrigated territory of Egypt has been doubled, though it is a territory where irrigation is as old as history. It certainly will be doubled when the land that is to be brought under cultivation by recent improvements has all been utilized. It would probably raise the irrigated area from between three and four million acres to somewhere between six and seven million. Now, in this country, in the beginning of the development of irrigation in the arid region, the people who begun this work were mostly from the humid portions of the country and they did not foresee the extent to which water was to be utilized or the value and importance that this development was to assume. The great majority of the people who came to the arid region came here with the idea that they were

to create in this country communities and cities that would be
5253 counterparts of those they had left in the East. They did not realize that the difference in climatic conditions must be accompanied by a corresponding change in the laws and institutions in order that we should have a systematic and orderly development, and so the diversion of water was left entirely to private enterprise. In the early days, the importance of regulation and control and the ultimate importance of titles to water was not realized. The conception was much as the conception held at an earlier period, that water was there for everybody to take as they pleased, and the feeling among those who were utilizing water was one of opposition to any sort of adequate regulation and especially to legislation. This I speak of from personal experience, because I gauged a great many of the canals in Colorado for the first time, and the general feeling of the canal owners was one of resentment at the State undertaking to interfere in any way with their diversion of the stream. Now, that lack of understanding of the importance that this question was to assume, of the impossibility of leaving to individuals the protection of their own interests or of securing a satisfactory division of the river when it was being diverted and used through long stretches of its course is the cause of much of the subsequent difficulty and uncertainty that have attended the es-
5254 tablishment of water rights in streams. We find as a result that the States that are partly humid and partly arid all incorporated in their laws the common law doctrine of riparian rights. The early settlements were in the humid portions of those States. The early laws were enacted almost entirely by people who were living in the humid sections of those States. And so we find in Nebraska, California, Kansas, Washington and Oregon, and in fact in every one of the States that surround the arid region that were partly humid and partly arid, they have all incorporated the common law doctrine of riparian rights. In the States, on the other hand, which were wholly arid, when they had acquired a sufficient population to become independent commonwealths and began to legislate on this question, the legislation was framed by people who had had experience in irrigation, an experience extending over a considerable period, and that doctrine was abrogated. Subsequently in every one of the other States when the arid portions of those States were settled up and the necessity for some sort of regulation of streams and some sort of protection of the rights of those who were using them became apparent, they enacted laws that were in conflict with the original doctrine by providing for the appropriation of streams and for determining the respective rights of appropriators in accordance with the doctrine of priority. We have in all of
5255 the wholly arid States, in the early legislation, and at subsequent periods in the States partly arid, laws providing for the diversion of water for use in irrigation, for the establishment of rights to the use of water for that purpose, and in some of them

administrative measures for the protection of those rights. In all of these laws there are two fundamental principles; one is that the first to utilize water shall be given the better right, the underlying idea of this being that when this use was made of the water the party using could not be expected to know what was to come afterwards; and when the next party came to a diversion it was with the knowledge, or should have been with the knowledge, that there was already a prior utilization.

So the purpose of the doctrine of priority is to protect each person utilizing the stream in the conditions that existed when he made his expenditures. The other doctrine, that has not been so closely followed in practice, is that each right shall be determined by the amount applied to beneficial use. So that in theory the purpose of this legislation is to promote the beneficial utilization of the stream and to protect that beneficial use.

Without going into the details of the water laws of these States, unless it is desired, I will take up now the conditions on the Arkansas river.

5256 After being detailed to this case, in order to acqaint myself with some of the facts showing the use and value of its water, two persons connected with the irrigation division of the Department of Agriculture were detailed to collect certain information regarding the extent of irrigation along the Arkansas river in Kansas and Colorado, and I will give the result, and say that this information has been drawn, where possible, from official sources. There being no official records in Kansas, it has been impossible for me to make very much headway there. We have had considerable correspondence with people living in Kansas, but have been unable to get any definite information regarding the amounts appropriated or the dates of the appropriation or the amounts utilized. In Colorado the information has been drawn from the State engineer's office, from the records of the different counties, and the information with respect to water rights from the reports of the water commissioners.

The information with respect to values of water and the areas irrigated have been drawn in part from the same sources, and in part from the replies of individuals, and I will give the names of those individuals in giving the information.

Colorado is the first of the States to deal adequately with the question of securing a proper distribution of the public water

5257 supplies. It was the first of the States to enact laws that would provide for the public control of streams, for the establishment of rights and for the protection of those rights in times of scarcity, for the institution of administrative regulations to prevent waste and to secure the greatest possible use of the water. Being the first of the States to enact these laws, it was a matter of course that some of the provisions would be imperfect. Some of them, I think, could be improved upon if legislation were to be enacted in the light of our subsequent experience.

The provisions of the Colorado law that have controlled the utilization of the water of the Arkansas river, are, briefly, these: That the rights are established by a proceeding in the district court in which all of the participants must present proof of the amount of water, the date when the water was diverted, and the amount that has been applied to beneficial use. For the protection of these rights, and for the convenience in the establishment of these rights, the water shed of the stream in Colorado has been set apart as a division, and that division has been subdivided into 11 districts, the size of the districts being determined by the extent of irrigation, and the ability of the water commissioner to properly regulate and control the diversions.

In the investigations of conditions along the Arkansas river in Colorado and Kansas, I will say that there was a map made under my supervision showing the stream and the different ditches
5258 that have been taken out of the river in Colorado. That map is now before me while I am testifying. So far as this map is completed, it is approximately correct, but there are certain facts that are in our possession that have not yet been placed upon the map, and there are certain other facts of whose existence we know but we have not the information necessary to complete it now.

(The map referred to was subsequently offered in evidence, marked Intervenor's Exhibit 7, as completed.)

5260 We have no official records of any ditches in Kansas. The ditches I refer to are in Colorrdo. We have districts 10, 12, 14, 15, 16, 17, 18 and 67. The whole of the Arkansas drainage is in division No. 2. (Referring to Intervenor's Exhibit 7) We have here shown in Kansas five ditches, but we have maps, I think, of ten or twelve ditches all together. The natural streams on this map are shown in blue. Every 500-foot contour has been placed on the map, showing the elevations of the country. They are in brown and the ditches are in red. The boundaries of the different districts are in green and the county and State and township boundaries are in black.

Now, taking up the extent of irrigation in the Arkansas valley in Colorado, the official records show that there are 1,837 ditches included in the decrees, and 659 ditches filed but not included in decrees, and of these ditches filed 124 have been reported as completed. The amount of water decreed to these different ditches is 9,459.25 cubic feet per second. The average daily diversion during the irrigation period of 1904 was 4,180.08 cubic feet per sec-
5261 ond. The total amount in acre-feet for the season of 1904 was 934,324. The total area reported as being capable of irrigation from existing ditches is 553,984 acres. The total area irrigated in 1904 was 345,175 acres. The irrigation period as given here is the period in which water is reported as running. It varies in different canals from 345 days for the greatest to one day for the least. The average number of days of the irrigation period as reported by all these canals is 69; and the average depth of the

water applied through the division is 2.76 feet. The earliest of these priorities is 1859, and the number of priorities established by decrees 2,477.

Taking up the storage of water in this valley, the number of reservoirs included in the decrees is 47; the number of reservoirs known to exist is 58; and the available storage capacity of these reservoirs in acre-feet is 243,277.

From the records of the State engineer's office the following information with respect to water filings in 1903 and 1904 has been obtained:

Total number of ditch filings, 109.

Total amount of water claimed, 9,690 cubic feet per second.

Total number of reservoir filings, 64.

In the establishment of rights to the water, the parties sub-
5262 mitting proof to the district court were required to prove the amount that had been put to beneficial use. In some instances these decrees show the basis on which the allotments were made, and some of them do not. The great majority of them seem to have been based upon the estimated requirements of the land, although in some instances the capacity of the ditches diverting water seems to have been the basis of the right. Thus, in district No. 10 the decree gives the dimensions of the ditch, but in No. 11 the basis is one cubic foot per second to 50 acres of land. In district No. 12 it gives the amounts claimed, but limits the rights to the needs of the land. In district No. 13 the decreed right is based upon the dimensions of the ditches—water for ditches of certain dimensions as given. In district No. 15 it is one cubic foot per second to 50 acres. In district No. 16 one cubic foot per second to 50 acres; in district No. 17 one cubic foot to 80 acres; in district No. 18 one cubic foot per second to 50 acres. In district No. 19 one cubic foot per second to 50 acres; and in district No. 67, 1.37 cubic feet per second to 80 acres, which is practically the same as one cubic foot per second to 50 acres.

The reports of the water commissioners as to the duty of water as near as it could be computed, are as follows:

In district No. 10 the number of acres served by one cubic
5263 foot per second is reported as 50 acres; in No. 11, 39 acres; No. 12, 44 acres; No. 13, 83 acres; No. 14, 130; No. 15, 62; No. 16, 54; No. 17, 104; No. 18, 92; No. 19, 48; No. 67, 237.

Now, this is an outline of the extent and character of the rights to the waters of this stream. In order to understand the difficulty of distributing this water supply among different claimants to the stream one must understand and consider the extent of the territory over which these ditches are scattered, the irregular order in which the priorities are distributed up and down the stream and the irregular and enormous fluctuations in the quantity of water to be distributed. Under the most favorable conditions there is nothing that is more difficult than to secure a correct division of water among irrigators, when the scarcity and the value of water make it neces-

sary to give a close regard to respective priorities and a close limitation to the quantity of water which each individual will take. We have on this stream over 2,000 different appropriations, over 2,000 different ditches taking water, and they are scattered over a country over 200 miles in length and more than half as wide. There is not simply the problem of dividing the natural flow between these different people, but a part of that water is stored, and stored upon the head waters of the stream, and in order for it to reach places where it is to be utilized and where parties are
5264 entitled to utilize it, it must be turned in and mixed with the natural water supply and the ditches down the stream so regulated that those that are entitled to the natural flow shall have their respective shares and shall not rob the owners of the stored water by taking a portion of that.

Q. That stored water is often carried hundreds of miles, is it not?

A. Yes, sir. If all of the water supply started at the head of a stream and we had the priorities running in an orderly succession down the stream, then it would still be a difficult problem to so regulate the division that each one would get its proper share of the supply. And to show you why it would be a difficult matter, we have prepared a diagram that shows fluctuations in the stream in different years. Not the fluctuations at different points in the stream, but the fluctuations in different years. (Producing map.) We have here a graphical presentation of the flow of the Arkansas river as measured at different points along its course in Colorado. We have no record of the flow in Kansas.

Q. In this connection, do you desire to refer to some paper or map which you have prepared in order to explain your testimony?

A. Yes.

Q. State what that paper is.

A. This is the paper that I hold in my hand at present. The total discharge in acre-feet of the Arkansas river for the months of May, June, July, August and September, for the years 1901, 1902 and 1903, is shown by this paper.

5265 (The said diagram, marked Intervenor's Exhibit 8, was here offered in evidence.)

This diagram marked Intervenor's Exhibit 8 shows by the relative sizes of the respective squares the total discharge at the different stations along the river where records of the flow have been kept. These records have been kept in part by the United States Geological Survey, and in part by the Colorado State engineer's office. Now, to show how greatly they vary at different points, we will take Salida, the station farthest up stream. There in 1901 the discharge—I will not give anything except the hundreds of thousands—was 245,000 acre-feet; in 1902 it was 117,000, or less than one-half; in 1903 it was 323,000, or nearly one-half more. Now, going down to Pueblo, in 1901 the discharge was 384,000 acre-feet.

Q. When you say that many acre-feet, it means that the water flowing in that stream for six months would cover that area one foot in depth?

A. Yes. In 1902 at Pueblo it was 137,000, or just a little over one-third; and in 1903 it was 324,000. Now, I wish to call your attention to a fluctuation there that illustrates the difficulties—the complications—that come with the ordinary diversion of water, no matter how efficient your administration may be. At Salida in 1901 there was approximately one-third less water in the
5236 river than there was in 1903. That is, the greatest discharge at Salida was in 1903. Now, when we go down to Pueblo the greatest discharge was in 1901. There we have the percentages almost exactly reversed. The variations in rainfall evidently account for it. The difference between the amount of water that came into the river between snow fall in the upper part of the river and rainfall in the lower part completely changes the amount of water in the stream—the character of the stream. Not only is the total water supply in the stream changed, but the rate of increase or decrease in the stream changes in the two seasons, and you will find the same variations in the proportions between 1902 and 1903. Now, the persons who have to distribute this water supply have not only to deal with fluctuations of that kind, but we have here some diagrams to show the fluctuations in the different months of these periods. The diagrams show the flow of the stream in the different months of the irrigation period at each of the different stations before named. Now, this set of diagrams shows the monthly fluctuations—or the monthly discharges of the Arkansas river in acre-feet and in cubic feet per second for the months of April, May, June, July, August, September, October and November, at Salida, for 1901, 1902, and 1903; also at Cañon City, Colorado, at Pueblo, Nepesta, Rocky Ford, Prowers station, all in Colorado.

(Said diagram offered in evidence, marked Intervenor's Exhibit 9.)

5270 The variations in the flow of water between the different months are delineated on the diagram marked Intervenor's Exhibit 9–C. The Purgatoire, which flows into the Arkansas river, is what might be characterized as a torrential stream.

5271 I believe that, taking everything into consideration, the system that has been developed by Colorado for the distribution of the waters of the Arkansas river is among the best to be found in the United States. It represents in many respects the
5273 most advanced work that has been done in that direction. Taking the crop returns from eight canals in the Arkansas valley—these being the Amity, the Bessemer, the Cañon City hydraulic dam, the Fort Lyon, Lake, Lamar and Rocky Ford Highline—in 1904 there were 105,285 acres of alfalfa which had an average value of $15. per acre or $1,557,275, and the orchard yield was $150 an acre, or $1,297,000. The sugar beets, 513 acres, with

an average value of $30.00 per acre. Taking the crops as a whole in the valley under those eight canals, the average return per acre was $24.68 and the average crop value for each acre-foot of water used was $9.17.

The land values under these canals for lands which without irrigation would probably not exceed the Government price per acre have been returned to us in their present condition as fol-
5274 lows: Land without water, $1.25 to $2.50, and with water rights but unimproved, $30. per acre; with a stand of alfalfa, $100 per acre, and in orchards from $150 to $500 per acre. The value of a perpetual water right for 80 acres is given at $2,500 to $3,000.

Other estimates have been made, some higher and some lower than these.

I have a report of crop returns from Garden City, Kansas, and the prices of crops there were practically the same as in Colorado along the Arkansas river, and the yields of alfalfa, alfalfa seed, and other crops the same as in Colorado.

Q. I would like to hear from you with respect to your opinion and judgment in regard to the operation of the doctrine of riparian rights upon the water conditions in the arid region.

5275 A. The doctrine of riparian rights is unsuited to the conditions of the arid region or the conditions of any region where the water supply is all needed for use because of the uncertainty that exists as to its application if the original conception of the doctrine of riparian rights is modified. Under what was formerly considered the doctrine of riparian rights, which did not permit of the diminution in quantity or the impairment in quality of the water, it would be impossible to make any use of the streams in irrigation, and when the doctrine is modified, as it has been in numberless instances, because of the necessity of an increased use of the water supply, then it ceases to become a definite doctrine and the extent to which use is possible is so uncertain that it always becomes a very serious obstacle to development. Not only is that true of the arid region, but it is also true of humid regions where for increased domestic uses or for any other purpose it becomes important to make serious encroachments on the volume of streams. It is always difficult to provide for that legally, and in order to make it possible to carry out important improvements, as, for example, providing an adequate water supply for the cities of New York and Boston, it becomes necessary to make large purchases of riparian lands to avoid being interfered with by the application of this doctrine. The city of Boston, in providing a water supply, had to buy large areas of riparian lands in order to prevent interference by the owners of those lands with the diversion and use of the water supply for domestic purposes. It seems to me that the doctrine that is now in force throughout the arid region is much better suited to all parts of the country where there are large uses of water, and is better calculated to protect the rights of all who have any

interest in that water supply than the doctrine of riparian rights. The doctrine of riparian rights, if enforced, is a restriction upon advancement and progress, and the doctrine that prevails in
5276 the arid region is in line with advancing civilization. The doctrine of riparian rights is a tax upon development, both in the arid and humid regions.

Q. Now, please state in your own language, professor, what you regard as the distinction between the doctrine of riparian rights and the doctrine of prior appropriation and application of water to beneficial use.

5277 A. The doctrine of riparian rights is a step in advance of the doctrine that regards water as a free gift of nature and that it belongs to everybody alike, and it differs from it in this, that it confers an aristocracy of privilege on the lands that abut the stream. It is a doctrine in which the owners of lands that abut the stream have the exclusive right to the flow of that stream past those lands, and it is attached to those lands, and in its original conception even those land owners could not divert and utilize that stream in such a way as to cause a material impairment in its amount. Now, the doctrine that is opposed to that is the doctrine that water, being one of the elements of nature, that is of incalculable importance and advantage to mankind, should be utilized to the greatest possible extent, and hence its diversion and use should be permittted irrespective of the place to which it is applied, whether it is on riparian lands or non-riparian lands, whether it is close to or remote from the stream; with this limitation on such diversion, that no diversion shall be permitted that would impair any existing right, that any one who had used water beneficially must be protected in his right to continue that use. In that way, if a riparian land owner had used water he would be protected in his right to continue its use, just as any one who was a non-riparian user of water would be protected in its use. However, to carry that out involves an administration of water. You must treat water like a valuable property. You must have a record of rights and a determination of the order of priority of those rights in order to protect them, and that is the system that has been established throughout the arid region.

5278 While I believe that the water administration along the Arkansas river in Colorado is entirely efficient, I believe that a higher duty will be obtained in time by better methods on the part of the farmers. My judgment also is that the future development of the arid region is dependent upon the doctrine of appropriation of waters and its application for beneficial use.

5279 Yes, it is a fact that in a portion of the arid region the doctrine of riparian rights has been held by the courts to prevail, in all of the States that are partly humid and partly arid. It was laid down by the supreme court of California. I know from my investigations and a study of conditions in California that the decision of the court of that State in this matter has not been followed practically by the farmers and irrigators there. The original

decision in Lux vs. Haggin was not acquiesced in. There were a great many canals completed before it was rendered, and a great many thousands of acres of land were already being irrigated. The people continued to irrigate those lands. In some cases they made arrangements with the riparian land owners or the riparian land owners would not object, and in that way they averted the application of the doctrine. In order to provide for the continuation
5280 of development they passed what is known as the Wright act. The evasion of that decision was not its entire purpose, but that was an important purpose of that act, by which all of the lands or large tracts of land along the streams were combined in one municipal organization and in that way dissenting riparian appropriators were brought into the organization, and they avoided interference with their irrigation and use of water through that. When the doctrine was invoked the decisions of the court interpreted the doctrine in a way that practically made the riparian proprietor an appropriator having prior rights to the use of the stream, and some of those decisions now have gone so far as to include among riparian lands all of the lands within the drainage of the stream. It becomes a question of how far from the stream you will consider the lands riparian, a question of whether it is simply the tracts of land that belonged to an individual at the particular time, or whether you can extend it beyond that. If you take the riparian lands and bound them by the individual ownership, you would have in some cases a strip of land running back from the stream half a mile, and in some instances four or five miles, or even as far as twelve miles from the stream, when you come to the great estates that border streams in California. And that question as to what are riparian lands is one of the most difficult questions connected with irrigation in California to-day. But as a practical question, the entire doctrine has been ignored and a great many streams have been entirely deprived of water, for they do not carry water probably thirty days in a year, and sometimes don't carry any water at all. Especially is this true in southern California. In southern California, where the Sweetwater reservoir is built in the channel of what was once a running stream, not enough water came down the stream in three years to cover the bottom of it. It was all diverted above.

5281 In respect to the modified doctrine of riparian rights of which I have spoken, I do not understand it. Each new decision, take it in California, is a new interpretation. I have read the decisions in Nebraska with respect to irrigation, and the doctrine the courts there undertook to lay down as governing the western part of the State. I am not able to understand how the doctrine laid down by the supreme court of Nebraska can be applied and permit the continuance of the development that already exists. (Objection by complainant.)

5282 The investigations with which I am connected have been from the first engaged in the study of problems of seepage

and return waters as one of the factors that enter into the duty of water.

Seepage water is very largely returned to the streams. They find their way down through subterranean courses and return to the stream or its tributaries. After the water sinks to a certain distance beneath the surface, then losses from evaporation practically cease and its subsequent disappearance is one of transit. It escapes back into the stream.

I have a record of the rise and fall of the water in a well near Reno, Nevada, this record being kept as a part of the studies to determine the duty of water at that point. It is on the experiment station farm near Reno, and my record shows the effect that the waters in that canal had upon the rise and fall of the water in that well at that place for 1903 and 1904. I have a diagram
5283 which shows the dates on which this land is located that was irrigated. The well is a considerable distance from the ditch. It is not affected in any way by the seepage from the ditch. The entire change in the rise and fall of the ground water here comes, I believe, from the water used in irrigation.

(Said diagram, being Intervenor's Exhibit 10, offered in evidence. Objection by complainant.)

Intervenor's Exhibit 10 includes two seasons, beginning with June, 1903, and ending with December, 1904. The immediate effect of each irrigation in the vicinity of the well is shown by the rapid rise of water in the well, and the influence of the general irrigation, the irrigation of the whole field, is shown by the continued rise of soil water during the irrigation period, and
5284 then its continuous decline after irrigation ceased, the decline beginning with September, 1903, and ending in March, 1904, beginning again in 1904, in the latter part of August, and was still continuing when the record ceased in December. Now the significant feature about this rise and fall is that between the high water point in 1903 and the low water point in 1904 the fall was 13 feet. That means that enough water to saturate the soil to the depth of 13 feet was drained out after the irrigation of 1903 ceased before the irrigation for 1904 begun, and taking the percentage of water that a saturated soil will hold as between twenty-five and thirty per cent. there must have been enough water returned to the stream as seepage from that field to have covered that land to a depth of between four and five feet. The total quantity applied to the field was about seven feet. Or, to put it differently, seventy per cent. of the water applied to the field in irrigation returned to the stream as seepage.

We have here a similar diagram showing the rise of water in the soil in the valley of Kings river in California, near Fresno, during the irrigation period, and the fall of that water in the soil after the irrigation period ended.

(The said diagram, being Intervenor's Exhibit 11, was here offered in evidence. Objection by complainant.)

The purpose of this exhibit is to show how irrigation accumulates water in the soil and how that accumulation is afterwards discharged at other portions of the season back into the stream through
5285 seepage, in both instances the water surface in the soil being so far below the soil surface that the loss from evaporation would be very slight. Practically the entire fall is due to its escape as seepage back into the stream at a lower point.

During 1902 and 1903 I made a study of the return and seepage waters from the South Platte in Colorado. I have the result of that investigation in the form of a diagram, which I now have with me.

(Diagram offered in evidence as Intervenor's Exhibit 12. Objection by complainant.)

This diagram is a comparative one. It shows the compar-
5286 ative volume of return seepage in the South Platte river for two seven-year periods. It is the average of those years for two seven-year periods, the first period being from 1889 to 1895 and the second from 1896 to 1903, excluding 1897. All the measurements in this time except for 1903 were taken from the reports of the State engineer of Colorado. Those for 1903 were supplied by the investigations of the office of experiment stations of the Department of Agriculture. The hatched columns represent the gain per mile in the various sections for the first period, and the solid columns represent the gain per mile for the second period. The vertical scale represents cubic feet per second per mile, and the horizontal scale represents distances along the streams. It will take a little explanation to interpret this diagram, and in order to interpret it one needs to know something of the growth of irrigation along the stream. In the interpretation of the diagram I depend upon my personal knowledge of irrigation along that stream during the entire period.

We have taken the following points along the stream: Beginning with Platte cañon, that is, where the stream emerges from the
5287 mountains, the next is the head-gate of the Pacific ditch, half way between the Platte cañon and Littleton; and then Denver, ten miles below; and then Brighton, a little over forty miles below; Platteville, not quite sixty miles below; Evans, between 70 and 80 miles; the Putnam ditch, between 100 and 110 miles; the Fort Morgan head-gate, a little over 130 miles; the Snyder, between 140 and 150 miles; and ending with the State line, 230 miles. Now, during the first seven-year period, between Platte cañon and the City ditch, a distance of five miles, the average gain per mile from seepage was a little over five cubic feet per mile per second. During that period the gain was larger than it was during the second period, and the reason for that is that it was in the be-

ginning of irrigation and there was a greater abundance of water than there is at present. A great deal of the irrigation was close to the stream. Since that time ditches have been extended farther away from the stream and the water is distributed over a wider area and is used in smaller quantities, and the consequence is that during the second seven-year period the return seepage has fallen to nearly a cubic foot per second per mile, the average for the last seven-year period being about four and a half cubic *cubic* feet per second of time.

Now, in a general way we find that in all of that older irrigated territory where water has become exceedingly valuable, where the territory embraced by those ditches has been extended farther and farther back from the stream, there has been a reduction
5288 in the return seepage. For instance, between the City ditch and Denver the return for the first period was about six cubic feet per second to the mile, and during the second about four and a half cubic feet per second per mile. Between Littleton and Denver the difference is more marked. Now, without going into the differences between all of these stations, we find when we go to the lower end of the stream, where, if there was any irrigation during that first seven-year period it was new—it was so new that the sub-soil had not filled up, and where, as a consequence, seepage water was not returning to the stream,—we find, for instance, between Iliff and Crook, a distance of about fifteen miles, instead of *their* being any gain at all from seepage there was a loss in the quantity of water in the stream. The probabilities are that that loss was from evaporation. It might have been from both seepage and evaporation. But anyhow, during the first seven-year period there was a loss. The stream, instead of gaining, lost about a cubic foot per second per mile.

Now, during the second period, a number of ditches that had been built in the earlier period have been continuously in use, and the water has saturated the soil, on the lands that they irrigate, and it has begun to return as seepage, and so during the second period, where there was a loss in the first one there is now, as near as I can estimate it here, a gain of about two cubic feet per second per
5289 mile. The same is true of the district between Crook and the State line, exactly the same phenomena. Where during the first seven-year period there was a loss in the river, there is to-day a gain in the river,—a gain not so marked as in the upper portion; which is due to the fact that irrigation is newer, the sub-soil is not fully saturated and the watered area not so extended as in the other.

Now, I will say that this increase in return seepage is a universal action; it is a change that takes place in the flow of every stream that is diverted for irrigation. The tendency of irrigation is to act as an equalizer. The excessive diversions are always made when there is an excessive flow in the stream, and the water fills up the soil during that time, as was shown in these diagrams, then finds its

way slowly back to the stream; that is, irrigation tends to dimish the flood flow of the rivers by diversion at that time and tends to augment the low water flow, or at least the late flow of the river, by the return of waste and seepage water. Now, the exact time when seepage water will return to a river depends on the distance from the stream and the character of the soil of the irrigated land and of the soil that the water is to find its way through. We have here an interesting diagram that illustrates this (producing diagram). This diagram shows the rise and fall of the water in a well near Sunnyside, Washington, in the valley of the Yakima river.

(Said diagram, being Intervenor's Exhibit 13, offered in evidence. Objection by complainant.)

5290 This diagram represents the rise and fall of the water in one of a series of wells which extended from a canal down to the river, this being the well farthest from the canal and nearest to the stream. I have not a complete set of diagrams here, but they, taken together, confirm the truth of the explanation made of this diagram. The variations in the level of the water in the soil begin with May, 1903, and end with November, 1904. Irrigation begins in April and continues during the summer months; but notwithstanding the water was being carried in this canal and used on the land under it, the water in this well continued to fall from May until the last of July, when it reached its lowest point. Now, in the wells nearest the canal the water responded immediately to its application to the land. The water in the well began to rise; and as we go away from the land the rise comes at a later date, so that there was a continuous retardation of the rise of soil water in the wells from the one nearest to the canal to the one farthest from it.

5291 It was a strip of land along the canal which was irrigated. Both influenced the well, but principally the land irrigated. Now, by the first of August the influence of that irr-gation had reached this well; the water that had been filling the soil along the line of the canal and rising higher and higher as shown on the records of wells near the land irrigated had found its way down the slope through the intervening soil and reached the well from which this diagram was made, and the water in the well continues to rise during the months of August, September, October and November, and then we come to the time when it is impossible to tell whether it is the irrigation water or other causes that are influencing it, because the rainy season begins and snow and rain affect it. In any event, it keeps rising until April, and then, just at the time when irrigation begins, the level of the water in this well begins to fall, and it continues to go down again as before until about the 10th of August. It reaches its lowest point the last of July, just as the year before, but does not begin to rise perceptibly until about the 10th of August, and then it starts up and continues just as it did the year before, showing that the effects of irrigation about three miles away had taken that time to reach this point, and here in

conditions like that you would have seepage water returning
5292 to the stream during the actual irrigation period rather than during a non-irrigation period as they would if the canal was closer to the stream or if the soil permitted of its more rapid passage. It is action of that character that explains in part the discrepancy between the volume of water diverted and the volume of water that is measured in many rivers at any particular point. I have not here at hand the records of the Arkansas river, but as I remember it the average flow of the stream as measured at Pueblo is about 1,000 feet per second. It is less than that. Yet we had diversions from that stream last year of over 4,000 cubic feet per second. That difference between 4,000 feet taken out of a stream which had only 1,000 feet in it where measured is due in part to the fact that that measurement is made after the diversions in the mountains and on a great many of the tributary streams. It does not take into account the effect of the diversions above, nor does it take into account the influence of the seepage water that returns. And that discrepancy between the flow of a stream and the actual service it renders is not confined to the Arkansas; it is general. I have here a report of the State engineer of Utah giving the amount of water in the Weber river at Devil's Gate, Utah, for 1904. Now, the gauge station on Weber river has been kept at Devil's Gate for many years. That is in the gorge between Evanston and Ogden. That has been reported
5293 as the available water supply of Weber river. During the last two years—1903 and 1904—the State engineer's office has been measuring the diversions of water from that stream, in all the ditches taking water from that stream, as a preliminary to the determination of water rights, and this shows that while on August 13 the amount of water in the river at the gauging station was 136 cubic feet per second—for the year 1904—(objection by complainant), on that date the amount diverted for irrigation was 635 cubic feet per second. On August 20 there was 134 cubic feet per second in the river, and 545 cubic feet per second was diverted. On September 10 there was 136 cubic feet of water per second in the river and 422 were diverted. Now, of these on the first date given, 475 were diverted in the mountain valleys above and 200 cubic feet per second were diverted below the gauging station. There are no tributaries coming in below that point; so that the difference between the 136 cubic feet per second gauged and the 200 feet diverted was practically the seepage water coming back to the stream, either from the canals as they take it out one from the other or the seepage water diverted earlier in the season. Now, take the last of those figures given, September 10, where 136 feet was in the river, there was 274 feet on September 10 diverted above and 148 diverted below.

I have not made any investigations in regard to return or seepage waters in the Arkansas river, nor has there been any made by the diversion of which I am the head. I only know the conditions pre-

vailing in the Arkansas valley in Colorado and Kansas as I have observed them casually. I think the conditions there are no different from what they are on other mountain streams in the arid region. (Objection by complainant.) The deductions which I have made from my investigations are that a large amount of return or seepage waters comes back to the stream after it has been applied to the land for irrigation purposes; and that condition prevails generally throughout the arid region.

5294 Q. Professor Mead, in your testimony this morning you spoke with respect to having some public control of the waters of the streams, and especially in regard to the arid region. I would like you to state what your views are with respect to that control.

5295 A. In considering that matter, we have to take into account the character of our present development. If in the first place there had been in some way established a system of irrigation districts which would have embraced drainage areas of streams so that an entire drainage area could have been included in one division, just as the drainage area of the Arkansas is included in one division in the State of Colorado, that would, I think, have been the ideal irrigation unit for administrative purposes; but the control of irrigation was left to each of the several States by Congress, and there has grown up in each of the States its own system of administration, and as a part of that administration there exists in different States widely different customs both with respect to the use of water in irrigation and with respect to the methods of distributing from streams and from canals. Now, the people of those different States have worked out those systems; they understand them. They meet their views, and they are wedded to them. It would be impossible at this date to disturb many of those local practices and local administrative regulations without causing a great deal of confusion and without arousing intense opposition on the part of the users of water. It would be a very difficult thing to do. When we come to consider whether it would be advisable to do that or not,

5296 we have to take into account two things—how are we to secure the largest use of water, and how are we to develop the best type of citizen? Now, there is no question, I think, that irrigation, being in its nature a coöperative industry, and an organized industry, which binds irrigators together by their common tie of dependence on the stream and by the necessity of their working together in the use of water from canals and reservoirs, and hence will get the greatest benefit to the community, and we best develop of their capacity to coöperate and to organize for this if we leave them as largely as possible untrammelled in their management of these resources. So that when we consider its effect on citizenship I believe that the plan followed by the Government in leaving this matter entirely to the States has developed a higher aptitude on the part of irrigators than would have happened if there had been less local control and larger Federal control in the original system.

This, I think, is the view that is entertained by the President, because in his message of 1901 to the 57th Congress, which is found in the Congressional Record of December 3, 1901, at page 86, he makes the following statement:

"The benefits which have followed the unaided development of the past justify the nation's aid and coöperation in the more difficult and important work yet to be accomplished. Laws so vitally affecting homes as those which control the water supply will only be effective when they have the sanction of the irrigators. Reforms can only be final and satisfactory when they come through the enlightenment of the people most concerned. The larger development which national aid insures would, however, awaken in every arid State the determination to make its irrigation system equal in justice and effectiveness that of any country in the civilized world."

The problems that exist in a State—they cover an area so great that the administration of the waters within a State is a difficult problem. Now, whether they would be improved or simplified if we grouped all of the States into one administration is a question that nothing but experience would answer. It certainly would enormously increase the difficulties of the detailed supervision that is to come when we have thousands of ditches scattered over hundreds of tributaries of a particular stream. Those States have been most successful which have gone farthest towards developing a capacity for handling irrigation matters by the people living along each stream; that is, by strengthening local administration rather than State administration. Take it in Colorado, efficiency comes by strengthening the administration in a water district rather than in the State engineer's office. It comes by education of the people of the district to work together. I have always believed that. In my eleven years' experience in the administration of water laws of Wyoming the efficient administration was only to be had through education of the irrigators themselves, so that they understood their system and felt a sense of responsibility for the administration of the waters of their particular stream—a local pride in making the administration in a particular district or along a particular stream the equal or superior of any other district. Just to the extent that we could arouse a public spirit and public pride in the working out of their problems themselves in the right way, just to that extent we had peace and successful development. Now, the truth of that was brought home very strongly by the conditions in Italy. The great success and efficiency of irrigation systems in Italy don't come from the fact that the State administers the rivers, but it comes from the capacity of individual irrigators to coöperate together and through the efficiency of local and volunteer organizations to handle these questions themselves. The most highly developed districts are districts where the water supply is entirely controlled by the irrigators and where they work under volunteer organizations that handle the canals. One of those asso-

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ciations has fourteen thousand members and handles over nine thousand miles of canal, and it has worked together now for more than fifty years without any disturbance, without any litigation and with complete satisfaction, so much so that it has become a type that is being followed in other sections of the country. I think, however, that as irrigation extends and water becomes more valuable, there must be a larger measure of supervision on the part of both the State and Federal Government than has hitherto been thought necessary or desirable; that this will come out of the greater scarcity and growing value of water; but I think that that supervision ought to be just as limited as possible and that the effort should be to develop capacity on the part of the water users in order that they may as far as possible handle these problems themselves.

5299 There are something over ten million acres of irrigated land in the arid region of the United States, and there is approximately invested in irrigation works in the United States $200,000,000. The population that this irrigated land supports amounts to many millions. It not only involves the people who live on the lands and irrigate them, but cities are supplied with cheapened abundant food supplies from the cultivation of those lands and manufacturing interests could not exist without their cultivation. I have made some investigation in regard to the amount of lands which can be added to the irrigated area by intelligent and proper use of the waters of the arid region, supplemented by flood waters in the shape of reservoirs and storage dams. I think it would not exceed ten per cent. of the total area of the arid region, which would be something between sixty and one hundred million

5300 acres. In this estimate of ten per cent. I mean all the lands in the arid region which are irrigated now and which may be irrigated.

The arid region of the United States has usually been taken as all the territory from the 97th to the 100th meridian on the east to the humid lands on the Pacific coast; but that definition is not complete. There are portions of the country east of even the 97th meridian that are semi-arid or do not always have an adequate water supply for the growing of crops without irrigation, and on the other hand there are scattered throughout the arid region isolated areas where crops can be successfully grown and are being grown from year to year without irrigation.

5301 The use of water for household and domestic purposes I would put as of primary importance. (Objection by complainant.) After that, irrigation. I would put irrigation even ahead of its use for power where its use for power would prevent its being used for irrigation, because you can provide your power in some other way and you cannot provide food in any other way. I would put irrigation as superior to navigation, because of the far greater value that you can get out of the water and because navigation is the one instance of the use of water where its importance instead of increasing is diminishing.

The arid portion of the United States, excluding Alaska and the insular possessions, is between one-third and two-fifths.

5302 Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

Yes, sir, I have been studying questions of irrigation for a number of years and giving my whole attention to the development of irrigation. So far as irrigation affects other interests, I would not have to consider that as a part of the study of irrigation. Yes, irrigation is very necessary to civilized life in the arid region, and I meant to confine it to that portion of the country where it is arid.

5303 Yes, I referred in my testimony to the Swiss cantons that were controlling and arranging their irrigation in the very best manner. As to what would be the effect upon certain lower cantons geographically located if one of the upper cantons should take all of the water of a mountain stream, I will say (objection by defendants) that whatever rights they had in the water would be destroyed.

5303½ As to those States which are partly humid and partly arid, as to whether the settlements that were made first were confined almost universally to the river bottoms, I do not know. That was not always so. I do not know how it was in the Arkansas valley.

5304 Yes, I stated that the average flow of the Arkansas river at Pueblo was approximately a thousand cubic feet per second, and that the entire diversion of water in the Arkansas drainage basin in Colorado was 4,000 feet. That is above and below Pueblo, both. I could not state from memory how much water has been diverted from the Arkansas river proper between Pueblo and the Kansas line, and I have no figures here. I could not state from memory about what years the large ditches between Pueblo and the Kansas line were constructed, and I have no means here of ascertaining.

Yes, I referred in my direct examination to Bulletin No. 140, prepared by J. S. Green and published by the Department of Agriculture. Mr. Green furnished all those figures, and I assume

5305 they were correct. I have no personal knowledge. (Objection by defendants.) So far as I am advised, I have no reason to dispute any statement in the book. I do not recall what the book contains, even, at the present time.

I am unable to state what effect the diversion of the water of the Arkansas river between Pueblo and the State line has had upon the flow of the river through the State of Kansas. I have made no measurements of that and have no definite idea. I have nothing on which to found a general idea. I have not made any investigations of that question at all.

No, sir, I do not know how the water was diverted between Pueblo

and the State line in the year 1884 or any year since that
5306 time, except in 1901, 1902 and 1903. As to what effect the diversion of the amount in the State of Colorado that I have just referred to would have upon the flow of the river through the State of Kansas, I will say that I am unable to state, because we have made no measurements either of diversion—we took official records in the preparation of these statements and made no measurements in either one of the States.

If the testimony in this case shows that in the year 1887 1,471 feet were appropriated by the defendants in this case in the State of Colorado and that the ditches were dug shortly after the appropriations and the water turned in, as to what effect the taking of that amount of water out of the flow of the river between Pueblo and the State line would have upon the flow of the river through the State of Kansas, I am unable to say. At the immediate point it was taken out at it would reduce the flow of the river to that extent. What effect it would have down below would depend entirely upon how much of that water came back. I would say furthermore it would depend upon the character of the stream as to whether it gained or lost in its course down below. If during the year 1890 there were 1,066 cubic feet per second appropriated and decreed to the large ditches located in the Arkansas valley between Pueblo and the State line and that the ditches were shortly after that dug and the water actually diverted, as to what effect that would have upon the remaining amount that was left after the diversions in
5307 the prior years, I will say as before that I am unable to state without having some knowledge of how much of that which was diverted came back. I am unable to state what effect it would have upon the river to divert between three and four thousand cubic feet per second directly from the river by the defendants, through the State of Kansas. As to whether it would have any effect, I have nothing upon which to base a conclusion. As I say, you take the diversion of that water at the point it was diverted, the tendency would be to reduce the stream just at that point by the amount diverted. Now, what its effect down below would be would depend, as I say, upon the amount of that water that was lost in evaporation or taken up by plants, the amount returned to the stream and the character of the stream itself.

Now, I have known canals to divert water and carry it through a section where the channel of a stream lost water and where the effect of the diversion would be to increase the supply below. There are a number of factors that enter into it. There is the amount of return seepage from the water distributed and the amount of loss if the water was left to run in the natural channel of the stream. Without some knowledge of both of these it would be impossible for me to make an answer that would be at all in-
5308 telligent or in any way accurate. Now, I want to just add, generally, that in streams where the losses in the channel of the stream would be slight, the general effect of such diversions

would be to reduce the total quantity going below, because there would be a part of it lost by evaporation and a part taken up by plants, and that would be one effect, a reduction in the quantity; another effect would be a tendency to equalize the flow. There would be less water in flood times, less water right at the time these diversions were made, and a larger quantity of water at other times.

I suppose in the Arkansas valley the diversions are made beginning as soon as you can get water in the ditches—March or April—and along as late as September. The main diversions, probably, in the upper part of the stream, are in May, June and July. The main diversions in the lower part, as I explained this morning, fluctuate greatly in different years, depending on the effect of storms and rains, and some of those come later. As to the general proposition and to what proportion of water that is diverted for irrigation is evaporated and absorbed by plant life, I will say, tak-
5309 ing the large number of measurements we have made and those we have collated, about two-thirds of it.

Yes, I am the author of the book called "Irrigation Institutions," and this statement corresponds to the statement made by me in that book in page 320. That agrees with the average. Now, I would say here, so as not to be misunderstood in regard to that, that that is an average, and like all averages, there are wide differences. Take it for instance on the Arkansas river, the probabilities are that in the narrow mountain valleys at the upper end two-thirds of the water taken out comes back instead of two-thirds being lost. When you go down to the canals that are far away from the stream, especially where there are new lands, there is not one-third gets back. The percentage given there on page 320 of my book is the result of a large number of measurements that were averaged.

Examining Intervenor's Exhibit 7, I would say that below a number of the ditches shown upon the map, and below, for instance, the Bob Creek canal and the Fort Lyon canal, there are large
5310 tributaries coming into the river. As to whether the seepage and return waters, for instance, from the Bessemer ditch, cut across, in their way on down the valley, the next large tributary that flows into the river below it, I will say that the probabilities are that the seepage water there finds its way back into the main channel of the stream. It don't follow down the line of the canal.

Yes, if by the time the seepage water from the Bessemer ditch gets back into the stream there is immediately below that another ditch with a head-gate in the river that takes, during the irrigating season, all of the water, it would take the seepage water from the Bessemer ditch as well. Yes, the same condition would exist on down the river where the conditions were the same. If the
5311 seepage water were confronted with a tributary just below the ditch, as to whether the seepage water would have to return to the Arkansas river at least as far up the river as the mouth of that tributary, I will say the probabilities are that the seepage water

follows the same line as the tributary. Now, the tributary crosses there at right angles. The probabilities are that the seepage water may not follow down to the river just parallel to the tributary and the tributary would not have any effect.

Q. But the seepage cannot cross the channel of the tributary?

A. Oh, it would come down into the stream.

Q. So that it is true, is it not, that the only ditch that could increase the flow of the Arkansas river by virtue of seepage would be the last one down the stream in the State of Colorado?

A. The action along the river, probably, is this: That it is directly analogous to the action shown in those seepage measurements on the Platte, that the ditches, as you state, that are below, in succession take the natural flow, and they take some seepage water; but that constantly increases the quantity of water taken by ditches farther and farther down the stream. The last ditch that takes seepage water, that is, if we take the instance you gave of the Bob Creek canal, the seepage water that it carried out comes back with
5312 the natural flow that was taken with it, and that increases the seepage that reaches down to the Fort Lyon canal, and so the Fort Lyon canal carries more water out than it would without seepage, and that in turn produces more seepage for the Amity. So that the increase from seepage water above travels down stream, if the canals are built in succession down stream, as it happens they have been in the Platte and the Arkansas rivers.

Q. Then is not this the net result of it all, that the return seepage from the ditches between Pueblo and the Kansas-Colorado State line goes to increase the amount of water that each successive ditch can take rather than to increase the amount of the water flowing in he river east of the Kansas-Colorado State line?

A. Well, it is like this,—that they successively increase, as you go down, the quantity of water in the river. If you take the Amity as the last ditch there, for example, supposing that it takes all the water out of the stream, seepage and everything else, then the quantity that came to Kansas would be the accumulation of seepage water from that canal.

Q. Yes, and that would be all the seepage water that would pass into the State of Kansas, would it not?

A. Yes. But if you increase that sufficiently you will get as much water from seepage from the Amity canal as you would get from the natural flow of the stream without any of these diversions.

5313 Q. Then if there is another ditch down below the Amity that takes all that the Amity does not take, and the seepage from the Amity, you would just have a recurrence of that, increasing the amount of water that each ditch gets but it does not increase the flow in the State below.

A. Well, it would just continue to travel on down. Of course the same action that increased the flow of the Fort Lyon and the Amity would in time travel on down, increasing the flow of the Kansas

ditches. The same action that would increase the Amity's water supply would increase that of the ditches down in Kansas.

I am not sufficiently familiar with the facts about the ditches between Pueblo and the State line to answer whether they have a sufficient amount of water for their needs during the irrigation season. The presumption is that they could use more, from the fact that they are building storage works to save more water.

I am unable to answer whether these irrigating ditches have enough water to supply all their present needs. It is not necessarily true that each canal successively on down would take all the seepage water that comes in above it, because there is very seldom a year in which a shortage is continuous. Usually, the shortage of
the water in the canals is for a brief period and the effect of
5314 storage is to tide over this brief period of shortage, and there
are other times in the year when, I fancy, on these streams as on other streams there is an ample supply. I was unable to get any records of the flow of the Arkansas river below the Colorado State line to know whether that has been increased or decreased in the later years, and all I know about that is the testimony I have listened to in this case.

Yes, I have been personally in Garden City. I saw the ditches that are located there. I was there last summer, and also in 1902, which was the first time I was there. I have a pretty general knowledge of those ditches as they are located through the three western counties of Kansas. If those ditches have been practically dry,
with the exception of the year 1904, for the last fifteen years,
5315 as to whether there was less water flowing in the river than
when they were constructed, I would say (objection by defendants) that would depend on the condition when they were built. I am not familiar with the history of those ditches, as to the abundance or lack of abundance of the water supply when they were first built. If they were built in the years 1880, 1881, 1882 and 1883, most of them, and that the water supply was reasonably ample for the next five years, and that from that time on it has diminished, as to why the water supply has diminished (objection by defendants), I would say there might be a number of explanations of it. As I say, I do not feel qualified, from what I know of the situation, to give an opinion as to that. It might be a change in the season, it might be less rainfall, and it might be the action of the Colorado ditches. I don't know whether there has been less rainfall in western Kansas
for the last ten or fifteen years than prior to that time. I
5316 have not examined the records of rainfall. In 1903 when I
was in Garden City the ditches were all dry. In 1904 they had plenty of water. Those are the only two years when I was there. The year 1904 was an excessively wet year, as they said, yes, sir. And that is my understanding from all the facts and figures that I have been able to gather.

The Purgatoire river is a stream where there are rapid rises, with variations in the flow. They may not be dry, but that it is a stream

that would be low and change quickly to a flood, a stream that is subject to floods. Usually that term "torrential" is applied to streams that go dry or practically so and then have very large volumes of water from sudden floods; but a torrential stream might be one that would have considerable flow. What I had in mind was to call attention to the great variation in the volume that
5317 takes place from the effect of rains. The Purgatoire river is perennial in the sense, I guess, that it has some water in it all the time, but it is not a true torrential stream.

When I spoke of diversions in the Arkansas River valley being in a very high state of perfection, I spoke of the large water supply when it is divided among irrigators. What I meant was that, here are two thousand irrigators, and its efficiency is in seeing that the one-thousandth and the fifteen hundredth appropriator each gets what belongs to him. Yes, of course that includes taking all of the water that they are entitled to.

Yes, I stated that I am familiar with the irrigation laws of the State of Colorado. As to what ground I would found the right of any ditch upon to take more water than its decreed appropriation, I would say I do not think some ditches have a right to take all of their decreed appropriation successively; they only have the right to take what they are actually beneficially using. I do
5318 not think they have any right to take more than their decreed appropriation. Then if some of those ditches during the years 1903 and 1904 for a number of days took two or three times the amount of their total decreed appropriations, as to whether I understand that that could be done in accordance with law (objection by defendants), I would say that so far as a legal right is concerned I do not think a ditch could maintain a right to take more than its decreed appropriation, but as a matter of practice, where there is an abundance, it is an almost universal practice for ditches to take whatever they can utilize, regardless of the amount of their decreed appropriations, in times when there is an abundance and does not affect some subsequent right. They are
5318½ only restricted to the amount of their legal decree at a time when it will interfere with the rights of some other appropriator. As to the extent of that practice, I will say usually when there is an abundance of water there is no supervision necessary over the amount that they can take. They take whatever they wish as long as no one's rights are interfered with. And when I speak of rights I refer to the rights of some appropriator and do not refer at all to the effect it may have on the flow of the river below. I will say this, that in all my experience the irrigators living on the lower part of the stream desire the fullest possible diversion during the periods of abundance, because when you divert and apply an excessive quantity of water you not only increase the total quantity which comes back as seepage—and that usually comes when you need it the greatest—but you increase the percentage of return seepage; and so in irrigated districts everywhere the

irrigators who live on the lower part of a stream welcome and
5319 encourage excessive diversions above when there is an abundance in the river. Well, I am speaking now of all the experience I have had, that where there is an abundance in the river it don't make any difference what the condition is below so long as there is enough. Of course in referring to the rights of parties below I confine it to the rights of appropriators. When the water becomes more valuable the tendency is to use it with more economy, and when it becomes more excessively valuable the tendency is to get along and raise the crop with the least amount of water possible. Yes, from any given acre there would then be less seepage or waste continually. Yes, the higher the degree of perfection irrigation is carried to the less waste water there will be to run to the river, but you increase the area. Now, the two actions that usually take place together in that respect—you take a given acre of land on any of these streams here and as a rule the more highly irrigation is developed the less there is from a particular acre, but usually along with that action two other things are taking place—
5320 the water supply is being spread over more acres and there are more acres for the seepage to come from. But the total amount of seepage that would come back would not be as great as where it is applied in excessive amounts to a single acre. Now, if your irrigation system were restricted entirely to diversions from the natural flow, the result would be to constantly diminish the value of the seepage water supply. But there has gone on in all these districts the accumulation in times when water is not needed at all, and especially in the winter months, of large volumes of stored water. That stored water is turned out in the summer months and it reinforces the supply and adds an additional element and increases the total amount of the seepage supply, making it possible to irrigate a great many more acres by the action of what is practically an additional water supply. All I know about the seepage water in the Arkansas valley is the observations I have made at Lamar and Las Animas last fall, just a general observation, and once or twice at times when I made trips there.

5321 As to the wells shown in the different parts of the country by Intervenor's Exhibits 10, 11, 12 and 13, I will say they could not be taken as a guide as to the percentage of the seepage water in the Arkansas valley, but I see no reason why the same action is not taking place there. The conditions are practically the same, and it was because of a belief that they do represent the same action that takes place in the Arkansas valley that they were introduced. There are none more extreme than the one at Reno, but I have a number here of other valleys in Nevada that are of the same character, and I could introduce scores of them that would be in excess of the ones in Washington and California. There were no successive ditches on those rivers illustrated by these exhibits so that we could judge as to the effect upon the flow of the river below, except on the Platte, that showed the action of the stream.

There are successive ditches, and it shows the actions of those successive ditches. As to what it shows as the effect upon the
5322 flow the stream below the Nebraska-Colorado line, we have no measurements below that line. No, the Platte river from that line to the confluence of the South and North Platte rivers has not been dry continuously for the last fifteen years. I think there is more water in the dry season of the year in that stream between the Colorado and Nebraska line and its confluence with the North Platte than there was before the irrigation began. The irrigation around Greeley has decreased the flow of the South Platte between the Nebraska-Colorado line and the confluence of the rivers, doubtless, during the flood season. Take it from the first of April to say the last of June, during that period it has doubtless decreased it, but from some indefinite point between June and July it is my impression it has materially increased it, on until October. It does flow during the dry season of the ordinary year between the Nebraska-Colorado
5323 line and the confluence of those rivers. As to whether there is an ordinary and an average flow of the South Platte for a number of miles above the confluence with the North Platte during the dry season of the year and during the ordinary year, I would say there have been several years it has been measured. For instance, in 1903 when we measured it there was a flow. As to how it has been for the last fifteen or twenty years I will say the probabilities are—now, taking our diagram there, Intervenor's Exhibit 12, the flow of the river over its channel there resulted in a constant diminution for the last fifty miles of its course during the first seven-year period. From the Nebraska State line fifty miles into Colorado during the first 7-year period the river lost. It lost on an average part of the way a cubic foot per second per mile, and during the other portion about half of that. Now, during that 7-year period that part of the stream lost in volume, either from evaporation or from seepage, or both, in the stream channel. During the last 7-year period the stream has accumulated water in that fifty miles in Colorado. These figures for 1903 were our own. The other figures were taken from measurements in the State
5324 engineer's office of Colorado. As to what effect it had upon the river for the first fifty miles below the Nebraska-Colorado line, I am unable to state. You see Nebraska has kept no measurements there.

5326 The Arkansas river is a perennial stream so far as Colorado is concerned.

Yes, sir, I have heard of the underflow in the Arkansas valley.

5327 Yes, on page 288 of my book on "Irrigation Institutions" I refer to the Arkansas river as one of the rivers of Kansas in which the flow is insignificant in comparison with the great amount of water that is under ground in the valley. No, sir, I have never made any investigations whatever so as to determine

either the velocity or the direction of the current. (Objection by defendants.) In my book I just stated what I had read in publications.

Mr. J. S. Green, who prepared Bulletin No. 140, referred to in my testimony, is a civil engineer living at Pueblo, Colorado, and is well qualified for his work. (Objection by defendants.) I
5328 myself as chief of the service prepared a letter of transmittal for this bulletin. The estimate of figures as given on page 28 of that Bulletin 140 (objection by defendants), as I understand it, is a statement attempting to give the divertible flow of the Arkansas river. Now, the question that arises here in connection with that statement is as to just what Mr. Green meant. If he meant to give the average of the quantity of water that could be diverted at Pueblo or Lamar or Rocky Ford or any place after the Arkansas and its tributaries came together, it probably is a statement not
5328½ far from the truth. That is, I would say it was a reasonable estimate. It is a fairly correct statement of the quantity of water that is divertible after you reach the main channel of the Arkansas river at any point down along the main stream, say from Pueblo. That would be my interpretation of the limits within which it would be a correct statement.

(Complainant here offered in evidence the table as shown on page 29 of Bulletin No. 140, prepared by Mr. J. S. Green, which reads as follows:)

"Mean Annual Divertible Flow of the Arkansas River in Colorado in Cubic Feet per Second.

January	660
February	700
March	800
April	1,030
May	2,630
June	4,370
July	3,250
August	1,100
September	700
October	690
November	720
December	720."

(Said Bulletin No. 140 offered in evidence by complainant.)

The information that I referred to in my direct examina-
5330 tion concerning the value of lands irrigated and unirrigated in the Arkansas valley was furnished me by letters from different parties in answer to letters of inquiry by me. Of course
5331 these letters were not sworn to in any way. I know of my own knowledge that the values set out in those letters

are practically correct. I am only familiar with the lands in the Arkansas valley in the vicinity of Garden City, personally familiar. That is the only part of the valley I have travelled over except as I have seen it from the railroad. I have been along the railroad there a great many times. You will find the same classes of land around Garden City and around Rocky Ford. You will understand that soils may vary greatly in quality in different sections at the same place, so that there are those local differences. I think
5332 the bottom lands with an ample supply of water under the Garden City ditches in the vicinity of Garden City would be worth from $75 to $100 an acre. I think they are practically as valuable around Garden City as the lands around Rocky Ford under the same state of irrigated cultivation.

Yes, I gave the duty of water in the different districts, and gave one cubic foot to a certain number of acres, varying from 39 acres up to 236. Some of the decrees on the Arkansas river furnish one cubic foot to 25 acres. The statement on page 153 of my work on "Irrigation Institutions" is correct, except that it says on that page several of them or more of them give one cubic foot per second to fifty acres. Yes, when I was at Garden City in 1903 I found the ditches there totally dry. Yes, the statement I make on page 320 of my book on "Irrigation Institutions" as follows:

"As water is now used about two-thirds of all that is diverted by ditches and canals is taken up by growing crops or absorbed by the air through evaporation. Approximately one-third of the volume diverted returns to the natural channel through waste and seepage.'

5333 is a correct statement, generally. Yes, the further statement on the same page, being as follows—

"In the future, because of better canals and more skillful irrigators, even less will return."

is a correct statement, generally. The further statement on the same page, being as follows—

"Many streams will in time, therefore, become mere remnants of their former selves. This change in a few instances has already taken place."

is also a correct statement. The further statement is also correct, being as follows—

"So little water runs in some of the rivers in southern California that the stream channels are now grown up with underbrush."

The further statement is also correct, namely:—

"Reservoirs catch the floods and ditches divert the ordinary flow."

As to the further statement, being as follows—

"It is claimed that the diversion of water in Colorado is causing

the bed of the Arkansas river in Kansas to be filled with drifting sand."

I don't know whether that is true or not. That is simply a claim. I believe that is a claim that is made in the brief of the attorneys for Kansas in their original petition. That is where that
5334 statement was taken from. I saw the bed of the Arkansas river when I was at Garden City, but I could not detect that there was any evidence of narrowing there, anything that I could notice. I made no examination to determine that fact.

As to the further statement that I made on the same page of my work above quoted, being as follows—

"To water many western valleys will involve drying up the streams which flow through them, and this physical fact ought to be faced frankly andhonestly."

(Objection by defendants.)

an answer to that question cannot be given to convey the truth without the explanation that is given in the book in other places and on other pages. To simply take that single sentence and undertake to answer it without an explanation is to give an entirely misleading idea as to its meaning, because the explanation and
5335 qualifications of that expression are found on other pages of the book. In explanation, I will say this, that the statements that have just been read represent the ultimate results of development where it is carried to its farthest possible limits, and the instances cited in southern California represent a development carried to that point where you not only have the surplus flow of a stream diverted by reservoirs and with ditches enough to divert all that is stored in those reservoirs, with capacity enough in those canals to carry away all that is stored, but you have in addition to that a large number of pumps engaged in pumping the underflow, and you have a considerable number of ditches that have been built for the purpose of developing water, and that is, they tunnel into the sands of the stream and intercept the seepage water that would otherwise return from the ditches. Now, there you have the utilization of water carried to the fullest possible extent—to the extent that is embodied in the passage you have referred to. That is the idea. It is a matter of mere mathematical calculation that if you divert all the water and a part of it returns as seepage, and then if you divert that seepage again and some of that returns, in time you will wear the entire supply out. And if you assume at the same time that the stream is not reinforced along its course, then of course the drying up of the stream will depend entirely on the extent of that reinforcement. But if you take a given volume of water, as for instance in the case of the streams that are cited there where the entire supply practically comes from the head waters—comes from the
5336 mountains—because there are four or five or six months there is no rainfall at all in the lower part of the country and very

little in the mountains—then it is only a question of enough ditches and enough land to completely wear out the water supply and hence to leave a dry channel. Now, whether that will take place in every stream or not is entirely a question of your ability to build enough ditches, and the further question of the sources of the water supply of that stream. If your water supply all comes from the head and you keep taking out ditches and then you take out other ditches to intercept the seepage, it is only a question of miles and acres until you have entirely absorbed the supply. And so on that assumption of physical facts the statement given in the book is absolutely true. It could not be otherwise. No one could question it, because it is a mere matter of mathematics. Now, whether that will take place on any particular stream is, as I say, dependent on the extent to which that stream is reinforced. If you have a certain amount of reinforcement from tributary streams or from the country through which it runs, added to a certain amount of seepage, then it is possible that you can continue irrigation throughout its entire length and you can never dry up your stream; so you can't say that that statement would apply to every river. It will apply to some rivers. It will apply to rivers of the character that were cited there as illustrations.

As to the next sentence in my book referred to, being as follows—

5337 "The doctrine of appropriation contemplates using all the water, and if it is to be carried to its logical end the rights of riparian appropriators on many streams must be encroached upon."

that is in connection now with what I have just explained. And the next sentence, being as follows—

"If, on the other hand, streams are not to be absorbed, if respect for riparian rights requires that a certain volume continue to run in the channel, a limitation should be put on the building of ditches."

as to this last statement, I say it is correct, I should say that the protection of riparian rights would not only limit the number of ditches but in some instances so seriously restrict the number of ditches as to prevent anything resembling a complete utilization of the water supply.

As to whether there is such a practice as the sale of water carried on in the arid States to any extent whatever, I will say there
5338 is in some of the States. The term "sale of water" has a great many meanings. For instance, the statutes of California provide for the appropriation of water for the purpose of sale, rental and distribution. That means that parties diverting and appropriating water can do so without having any land, for the purpose of selling it to people who want to use it. In Colorado I might perhaps give several ways in which the term "selling water" is used, to make this matter clear. An individual or company who builds

ditches may build them for the irrigation of his or its own land or for the irrigation of a great many tracts of land, and he furnishes water to the people under that ditch, and that transaction in common speech is spoken of as the sale of water. Now, that sort of sale may mean simply a charge for services in transporting the water, and yet in common speech it is spoken of as selling water. It is not. It is really a charge for the service of furnishing the water. Especially is that true where a charge is made on the basis of an annual payment or annual rental. Then there are other ditches built where the owners of those ditches sell what is called a perpetual water right. Now, that may be a contract for the delivery of water from that ditch perpetually for a given sum of money and it means a right to have de-
5339 livered from that ditch, a certain quantity of water. There is another form where a water right of that kind—a water deed—conveys an interest in the property itself. It becomes a part interest in the ditch and its appropriation. Now, take it in Colorado, most of the appropriations, and in fact all of them that I have seen, go to ditches. They do not go to the land. They may be based upon the capacity of the land. There is another kind of water sale that prevails in the arid region, and that is this: A party acquires an appropriation in a stream. Now, that is an interest in the flow of the stream as it runs, and the basis on which it is acquired is that that water is to be applied to a specific beneficial use in a specific place. Now, there has grown up in the West a doctrine that permits of the sale of these rights in the streams and the transfer of the water to other places and to other uses. The first forms of sales of water rights are to my mind entirely proper and legitimate features of development. I regard this latter form as a very injurious and dangerous innovation. The dangerous feature is this—that it, to my mind, perverts the original idea on which titles to water were acquired and opens up a very grave danger of the creation of water monopolies by which a single individual or company can get entire control of a particular water supply and levy tribute upon those who wish to use it. It is dangerous in
5340 another way, because it furnishes a means not otherwise possible of taking advantage of the mistakes of the earlier decrees. Now, all of the earlier decrees gave rights to quantities of water that may have been used at that time but which are in excess of the ultimate or permanent requirements of the land because of the fact that the use was wasteful and unskillful at that time and the land had not been brought in condition for cultivation—the land was arid. When you cultivate that land, after it has been saturated, after the farmers have become skillful users of water, the requirements of that particular use are less, and so whether or not there was a surplus appropriation in the first place there ultimately comes to be a surplus appropriation when measured by the necessities of that particular use in time, and sales of this kind simply enable the parties acquiring such surplus to turn it to account and to use that surplus to

defraud actual beneficial users having later rights. The true doctrine of water control and water rights is that all rights, especially all perpetual rights, should be based upon use and should be limited to use. Now, in rights to land—rights for irrigation—the only satisfactory measure of a use is the necessities of the land for which that right is acquired, and if you attach that to the land and measure it by its necessities, there can be no possible injustice to any one, there can be no possible opportunity for the separate ownership of
5341 water and land or for the acquiring of the control of streams by speculative holders. The right always goes to the land; it is naturally a right of use. Now, another reason for attaching the right to the land, if you are going to have a right based upon use, is this, that no irrigator uses water all the time. Few use it half of the time, if you take the whole season through. And if you are going to give him his water in the way to get the greatest service out of it, he will not use it all the time, he will rotate with his neighbors. Now, if his right to water is a right to his land, whatever water it needs, then you are always in a position to institute reforms in administration that will permit of rotation, that will permit of the highest possible service and will absolutely prevent any increase in earlier rights; and if, on the other hand, as has been the case, you give a farmer a right to the maximum quantity that he can use on any one day or in any one month in the year, then he might want to sell it for the time that he don't need it, and that is what sales to others of rights in a stream make possible, and out of that grow abuses and injury to subsequent appropriators. All the time the holders of the earlier rights are seeking to magnify those rights in order to make money out of what was given them as a free gift. Now, if we are to recognize water as a form of property, so that a man can own a share in a stream, that is a kind of property in the first place that belonged to the State. I think it is
5342 perfectly legitimate and proper for the State to give the right to use that in a specific way to its citizens, but if it is going to give the right to sell it, then the State ought to charge for it in the first place what it is worth. It ought not to be given away. If rights to a stream are property rights and can be bought and sold, then I do not think those rights should be perpetual. I think those rights should be conferred as similar rights are in Italy. There the parties that are permitted to divert streams are given a right to a definite quantity of water, but it is treated like a franchise, and that right only runs for a certain number of years. Thirty is the period now. No perpetual rights are given, because the Government has at considerable expense and the people themselves at vastly greater expense had to buy out and extinguish the earlier speculative rights like those that are being recognized in some of the Western States. If it is a franchise and limited to a certain number of years then if any abuses ever come up in the prices charged or the conditions exacted by those who have had control of this supply and furnished it to others, the Govern-

ment or people are in a position at the end of the franchise period to correct them. Now, I want two limitations or qualifications of the doctrine of the attachment of water to land where it is a
5343 right for irrigation. One is this,—that by attachment to land it means that if you acquire a right for irrigation you cannot sell that for some other purpose; you cannot acquire a right for a particular ditch in a particular place and then by a sale make that a floating right that can be shifted from one part of the stream to another; but if here is a right to a particular eighty acres of land and that particular eighty acres becomes unproductive or unprofitable, and there is another eighty that is better, I see no injury or wrong in permitting a shifting of that right from one eighty to the other eighty. There is no increase in the use of water or change in the character of the appropriation. I would not permit such shifting without the consent of the irrigation authorities in order to prevent injury to the later rights. Sales of appropriations take away the original standard of measurement and substitute therefor a right to a given volume of water for the entire year. That is one thing I would permit. Another thing I would permit is the condemnation of any kind of right for domestic purposes. No one can measure the growing needs of cities and towns, and for water for domestic purposes an ample supply must be had to meet those growing necessities. Now, an irrigation right is not like one of those rights, because an irrigation right tends to get smaller if it is limited to the requirements of the land. Domestic rights must grow. Now,
5344 what should be done is to permit of public condemnation of water rights where a city or town needing to obtain additional supplies pays for whatever damage or injury they bring, so as not to make it a matter of private bargain and sale but to make it a transaction that will be under public supervision and public scrutiny. Make it a public transaction.

Under my explanation of the last condition of sale, as to whether it would not allow the first appropriator to sell the excess water to a third appropriator and prevent the second appropriator in time from getting any (objection by defendants), I will say I do not think an appropriator of water for a particular use should have any
5345 surplus. No surplus should be recognized. The right to sell a surplus always contradicts the doctrine of priority and the doctrine of beneficial use. If rights in the first place are measured by use and are limited to beneficial use, then whatever is left over after the needs of No. 1 are satisfied belong first of all to No. 2 in the order of priorities, and there can be no surplus in the right of No. 1 that can be disposed of to the injury of No. 2. On the other hand, in like manner, under the true interpretation of this doctrine, if there is water enough for the needs of No. 1 and No. 2 then there should be no necessity for No. 3 buying a surplus, because he is entitled to it under the law. This is what I refer to on page 155 of my book as the conditions that exist under some of the

earliest decrees in Colorado. Yes, under the Colorado law
5346 the sale, as I have described it there, was allowed and practiced. I think limitations have been placed upon it both by statute and by subsequent decisions. I would not undertake to say just what is the present situation in the State of Colorado, because recent decisions have placed limitations on the practice of selling water rights in this State (Colorado) in accordance with the doctrine I have stated. Now, as to what will be the ultimate solution of this question in this State, as I regard it, there has been no definite settlement as to the policy upon that question. There are instances that are direct sales of surplus appropriations, and there are instances where sales of that character have been denied. But what will be the ultimate doctrine in Colorado it will require a prophet to tell. But I believe that the tendency to-day it to restrict rights to actual necessities and to put an end to these transfers. I think that the earlier transfers that were made have been made prolific of abuses, and the danger of this thing is becoming generally understood.

Examining the quotation that I made at the bottom of page 156 of my book, I will say that is a quotation from a brief by Mr.
5347 Platt Rogers in regard to one of the earliest of these sales, and I would further say that I am in entire accord with Mr. Rogers in his views on transactions of that character. (Objection by defendants.)

By "late irrigation" I mean irrigation in the latter part of the summer—in August. In the Arkansas valley the average of the diversions for irrigation last year (1904) was sixty-nine days. There are probably some irrigations in the Arkansas valley for fruit as late as November. I could not state just how the irrigation is practiced. That probably varies with different seasons. But it is desirable to irrigate orchards just as late as possible, and that late irrigation for orchards is recognized as very conducive to production. It is an excellent practice for everything.

5348 The statement in my book on page 170, being as follows—

"The irrigation of orchards require the use of as much water in November as in May. Alfalfa, potatoes and small fruits all require late irrigation."

is generally a correct statement.

Yes, there are certain States in the arid region in which the doctrine of riparian rights has been either abandoned or abrogated, and in certain States in the East the doctrine is still held, and there is an intermediate class of States lying between these two sections where both doctrines are to a certain extent enforced. Yes, it is true that in the arid States there is irrigation practiced upon the upper regions of interstate streams that in their lower reaches flow through States where the doctrine of riparian rights and former civilizations might be affected by the irrigation in the upper States. Yes, there are a number of such streams, and the Arkansas is one

of such streams. The two branches of the Platte, the
5349 Yellowstone, the Missouri and the Snake are other instances of such rivers.

Where the river is an interstate stream and where the waters of that river have been used for one purpose or another in the lower State, as to what extent I would allow the doctrine of appropriation of those waters in the upper State where such appropriation interferes with the prior interests in the lower State (objection by defendants), I will answer that I believe that the doctrine of
5350 appropriation of water as a general principle governing the utilization of the water supply is the doctrine best suited to existing industrial conditions, not simply in the arid region but in all regions where water has become valuable as a commodity, where it is valuable as a form of property in itself, and that situation already exists in every large aggregation of people, in every large city and in large centers of manufacture in the humid regions. In the arid region the water is one of the most valuable forms of property in itself, and hence ought to be considered simply as a form of property in itself, irrespective of its relation to any other kind of property, and handled in that way; and as I stated yesterday, I believe that the doctrine of appropriation coupled with the doctrine of protecting prior rights to beneficial use is the doctrine which should prevail, and that it should displace the doctrine of riparian rights. Now, wherever the conditions of aridity require the use of streams for irrigation, I believe that the doctrine of priority of appropriation should prevail. I think it should prevail in every State, and that the existence of a State line has nothing whatever to do with the meritorious character of that doctrine, and that the principle should be so applied as to protect prior rights—the prior appropriators in the lower State against the encroachments of later appropriators in the upper State. Now, when we come to
5351 consider that question, it has practical difficulties because the system of one State cannot be extended across another State. You have separate officials and separate laws in the different States. There are two solutions of the difficulties arising out of that situation; one is to turn the entire control of the water supply of the streams over to the Federal authorities and to ignore State laws; the other is to seek some solution of this matter which, while retaining intact the local control in particular localities and the maintenance of the laws and customs of each of the States so far as they apply to their own citizens, will at the same time protect the rights of the users in the lower States. Now, there are two ways in which the second alternative is possible; one is through an agreement of the officials of the different States as to the measures by which they will secure a proper division of the supply; and if such an agreement cannot be reached then some higher authority must be invoked, and that higher authority is the Federal Government. There will unquestionably be less disturbance if it could be arranged that

each State would have its own local system. And that there
5352 should be some Federal official who would act as arbiter, a sort of interstate water commissioner, to whom the authorities of both States should report the conditions of the water supply and whether or not it was adequate to their needs. He would have the table of the priorities and the rank of the respective rights, and in case of complaint he should have authority to call upon the upper State to turn down whatever was necessary to meet the necessities of the lower State. Then the question comes, whether a demand of that kind could be enforced in good faith on the upper State. If it could be there would be no disturbance in the relation of the rights, there would be no disturbance in the administration of the stream. It would be just as it is now. The only difference would be, there would be a little less water in the upper State to apply to the lands in that State. Now, I think the growing importance of water is going to make it necessary to have some adjustment of this question between the States. It cannot go on indefinitely without such an adjustment. Whether it comes now or ten years from now, it must come some time. I can see no way out of it except along one of these two lines. Either the State authorities, if left in entire charge as they are now, must recognize the superior authority of some agent appointed by the court or by some legislation that might be enacted hereafter to act as an arbiter in times of necessity and to enforce a division, or there will come a complete control by the Federal authorities. That is supposing that the rights across State lines are to be recognized. I am going on the assumption that prior rights to water in the lower State should be recognized.

5353 As to whether I would confine the prior rights in the lower States solely to the water used for irrigation or to any prior beneficial use and proper use of the water, I will answer: I would recognize any beneficial use that is recognized in the upper State, but I would not recognize the doctrine of riparian rights if it is recognized in the lower State.

Q. Supposing it has a use in the lower State for power purposes prior to any appropriation in the upper State. Would that be one of the rights you would recognize?

A. That is going now outside the question of irrigation and raises an entirely different issue that I would not want to make a categorical answer to. I believe there should be limitations on rights to the water. I think we should in this country establish in the appropriations of water a recognition of higher neccessities. I believe that the doctrine or the plan followed by Italy is the correct one, that they do not simply make priority the sole guide, but they do take into account the benefit which is to come to the public. That ought to be considered. Now, I would say this, that if navigation was a prior use of the water of the lower part of stream and that there was a prior right to use water for navigation, I would not recognize the prior right, because that means, practically, you see, the entire waste of the stream. Suppose you have a mill

down on the lower course of the stream—you might h-ve a mill down at Wichita. To furnish water enough to run that mill would mean the turning of the entire supply of the river down to a point where it is of no use for irrigation, and there the recognition of a right of that kind entirely destroys the principle of application to beneficial use.

5354 Q. Then if the use of the water for that mill is prior to any irrigation, how would you dispense with the vested right in the use of the water in that mill? Otherwise than by the right of eminent domain and condemnation? (Objection by defendants.)

A. Well, that could be done in two ways. You could say that a use that was so wasteful and so destructive of values in other places was not a benficial use. I think it would be an extreme construction of the idea to say it was a beneficial use if it were a use that meant practically the destruction of the whole property.

5355 If the use in the lower State was for domestic purposes, I would recognize it even if the irrigation in the upper State interfered with that. If the use in the lower State was for the raising of crops, not by irrigation, and had been for years prior to the irrigation in the upper State, as to whether I would recognize that use of the water, I will answer: That becomes, then, a question of proof as to how far it is to be recognized.

Q. Now, if the water in the Arkansas river and in the Arkansas valley had been used for the cultivation of crops in the lower part of the valley in Kansas, not by irrigation, for a number of years prior to the irrigation in Colorado, do I understand you to mean that you think the doctrine of prior appropriation in Colorado for irrigation purposes should be carried so far as to destroy or decrease materially the production of those crops in the lower part of the Arkansas valley in Kansas? (Objection by defendants.)

5356 A. Well, I would answer that this way, that where ditches have been built in Kansas for the diversion of water and for its use in irrigation, there is no question whatever that that was an appropriation and use of water for irrigation, and I would recognize anything of that kind, because there is no question in my mind that it is an appropriation of water in the same manner as an appropriation is made in Colorado; but when you speak of the use of water from a stream for the growing of crops, without any visible evidence of its having been used for that purpose, then the question arises, Was there any such appropriation? and as I said right at the outset of your inquiry, it would be entirely a question of fact as to whether that had been done or not.

Q. Then if I understand you, if it were a question of fact, positive fact, that the water of the river and in the valley by this sub-irrigation did produce those crops and the destruction of the water in the river and the valley either materially destroyed or materially decreased those crops, you do not mean to say that the subsequent appropriation in another State should be carried so far as to n terfere with that prior use?

5357 A. Oh, if the fact that there were crops grown and it was known they were grown that way and that they could not be grown without it, were established, I would say it would be entitled to consideration. But I would say further about any claim of that kind that it should be scrutinized with a great deal more care than a claimed based upon an undisputed fact like the building of a ditch where the person intended to use that water and was using that water. Now, in the one case we know there was an intention to appropriate; in the other it is not known; there is nothing that conclusively establishes it, like where you build a ditch. There you know you cannot grow crops without irrigation; the mere fact that you built the ditch shows that this is recognized; but where you cultivate crops without any expenditure or effort to appropriate water, then it becomes a matter, I should say, of conclusive proof as to whether the water was the factor that grew the crops.

If the ditches in Kansas were prior to the ditches in Colorado, oh, I think appropriations should be recognized across the State line. You cannot say that a State line cuts no figure. It cuts a very serious figure when you are working out the practical
5358 solution of it. It don't cut any figure as to the principle—as to the application of the doctrine—but it does when you come to work out a plan that will make it effective. This is precisely what I endeavored to state in my work on "Irrigation Institutions" in pages 372 and 377.

Yes, the statement on page 372, being as follows—

"There are many instances where one stream is a source of supply for irrigators in two or more States. It is beginning to happen that the perennial flow of these streams, which was first appropriated in the State along its lower course, has been utilized at a later period in the State above."

is a practically correct statement of it.

The further statement at the bottom of page 377, being as follows—

"Where a stream flows from one State into another the Federal authorities can determine how much of the water supply belongs to the lower State and may require the State officials to so regulate head-gates as to permit this volume to flow down. This can be done in such a way as to leave it to the State officials to determine which head-gates shall be closed and what rights shall be protected in the use of the water to which either the upper or lower State is entitled."

5359 This is a correct statement so far as read. I have no objection to your putting in the whole paragraph. I should prefer to have the entire paragraph read, especially the portions of the paragraph which follow. This is a correct statement.

Q. You may answer the question I have asked you, and then you may further read any part of it in addition to the part I have read

that you may wish to. (Last quotation from "Irrigation Institutions" read by stenographer.)

A. That is a correct statement, if you will permit this explanation, which would not be necessary if the entire chapter were inserted,—that by "determine" here it does not mean that the Federal authority will determine the original question as to the rights. What I meant here in speaking of this authority was that there should be some official who would stand as an arbiter and on the report of the authorities as to the conditions in the two States he would decide, having the rights before him, how much should be turned down. It is a correct statement if it is understood
5360 that this Federal official don't determine the original rights, but that it is simply an administrative measure so that after the rights have been determined and on the statement that there is a particular water supply in the stream so much of it should come down to the State below. Now, I should like, in connection with that, to insert this portion of the chapter as a reason for making this explanation of that word "determine" in the first part of the paragraph quoted. Thus, on page 378:

"It is in every way desirable that there should be no greater interference with local control than is absolutely necessary. The wide difference in local customs and local conditions renders it possible that a general law should everywhere work equally well and makes it desirable that each State should develop along lines best suited to its environment. In most valleys the division of water among irrigators is as much a local matter as the municipal regulations of cities and towns. The people who live there understand their water supply, the needs of the land, and the local peculiarities of soil and climate. It would be unscientific and in the highest degree unfortunate if the principle of local self-government, on which this nation is founded, and the opportunity to exercise self-reliance and self-control, which has done so much for its manhood in the past, should be taken away from the irrigators of the West by the transfer of the local regulation of streams to some centralized bureau. It is believed that Secretary Wilson, of the United States Department of Agriculture, in his last report outlined the policy which should govern future development when he said:—'Reform in irrigation laws will only be final and satisfactory when it comes through the enlightenment of the people most concerned. In a matter so vitally affecting the home as the control of the water supply, no legislation will be effective which has not the sanction of the irrigators themselves.'"

Now, that is one side; the other side is that question as to the protection of rights across State lines. You see if the two States cannot agree among themselves some higher authority must be invoked, and I see nothing else except the interposition of some official of the character of which I have spoken to see that justice is done between the two States, and a superior control to that extent.

5361 Oh, yes, the flow of an inter-state stream could be made more uniform and beneficial if the flood waters were impounded in reservoirs along the upper reaches of that river and then used during the dry season of the year, and this plan is feasible if you can find the sites. Yes, the idea stated in the message of President Roosevelt, found on page 86 of volume XXXV, part II, first session of the 57th Congress, in the Congressional Record, reading as follows:

"The Government should construct and maintain these reservoirs as it does other public works. Where their purpose is to regulate the flow of the streams, the water should be turned freely into the channels in the dry season, to take the same course under the same laws as the natural flow."

5362 I think is the correct doctrine. Yes, the net result of that would be that in impounding those waters it would increase the amount of water that could be beneficially used during the irrigating season. Not only that, but the impounding of water enables water that would be used in the unprofitable season to be used at a season when it will work its greatest benefit.

I cannot give the amount of appropriations in Colorado from the Arkansas river prior to January 29, 1861. I have the data but haven't it here, and I could not give it from memory. It is very small, I think.

Cross-examination on behalf of defendants.

By Mr. DAWSON:

5363 The doctrine of appropriation in the United States has really had its growth and development in the arid region, and that was true because of the necessities of that part of the country. The right to appropriate and use water on the soil for irrigation in that part of the country which is called arid is not only desirable but it has been and is absolutely vital in the growth and development of that part of the United States and is absolutely necessary to any creation of wealth in lands or to the support of any considerable number of people. It not only increases the number of people that are supported directly by the soil but it makes possible the development of other industries by reason of furnishing the means of subsistence for those engaged in such other industries. It is also necessary in the border land between the arid and
5364 humid countries to carry out the fullest development of its possibilities. There is a large area of country lying between that which is truly arid and that which is truly humid that would support but a sparse population unless the amount of water which falls upon the soil was reinforced by the appropriation of the waters of the streams which go through the country. It not only increases production but adds immensely to the comforts of life so that it creates better conditions of life. I would say further in that direc-

tion that as population increases and agriculture becomes more intensive the desirability of using streams for irrigation will extend to the humid country, just as it already has in the densely populated districts of the Old World, where we have larger sums expended for providing the water supply for irrigation in countries with a larger rainfall than that of the Mississippi valley than are expended for providing water in this country for the arid region. There is no question but even in a humid country the population that could be supported could be greatly increased if the rainfall were reinforced by the use of the water from the streams as the country becomes densely populated. The market gardeners in the vicinity
5365 of eastern cities are providing a water supply for irrigation. It is becoming almost as universal where high priced crops are grown and where a water supply can be procured as is provision for adding to the fertility of the soil in other ways. (Objection by complainant.) It is true in almost all parts of the United States known as the humid region that there are years when droughts occur and seriously affect the productiveness of the land. (Objection by complainant.) Yes, the provision of an irrigation system would have an effect inovercoming that. (Objection by complainant.) Two years ago we collected the results of the experi-nce and gathered the opinions of a large number of irrigators along the Atlantic seaboard in a country with a rainfali varying from thirty to fifty inches, and in not a single instance did any one who had irrigated express any intention of abandoning it, and in many instances they said they based their entire profits upon the practice, and in some instances they said their profits had been increased four or five fold through the adop-
5366 tion of irrigation. It is difficult to generalize in regard to the difference in production of lands under irrigation and those not under irrigation in humid regions were the conditions are similar, because there may be seasons when no irrigation will be required; that is, there will be one season when irrigation will be of no benefit at all, and then there will be other seasons when the ability to apply water in irrigation means a difference between an abundant crop and a complete failure; and the advantages of irrigation are not measured alone by the increase in production but by the fact that you are enabled to grow an abundant crop where there are general failures of that crop in the country not irrigated, and hence to command a much higher price because of that. The only large area where I have ever known of the statistics being gathered is in the irrigated region of Lombardy, where the department of agriculture of the kingdom has gone to a considerable expense to gather over a series of years the results of farming by rainfall alone and by irrigation. There the average rainfall approximates 40 inches, which is about that of the Mississippi valley, and the results are about this—that the practice of irrigation doubles the population, doubles the taxable value of the property and about trebles the crops produced. And that is in a humid country.

5367 The productiveness of an acre of well irrigated land in the arid region of the United States is considerably greater than that of an acre as nearly similar as possible in the humid region, and there is no question but that irrigated lands will support a larger population per acre by agriculture alone than will the humid country. They will support it because the conditions governing crop production are more largely under control. You can have a more scientific system of agriculture. You are not subject to the same vicissitudes; hence extensive farming is more profitable. And you also have a far wider range of products than is possible under rainfall, and our experience has already demonstrated that when it comes to growing high price crops, products having a high acreage value, we are achieving a far greater success in the arid districts than in districts under rainfall alone.

5368 It is my conviction that the second doctrine (of appropriation and application for beneficial uses) is the one best suited both to the protection of all legitimate rights and for the development of our resources in the entire United States as a whole. (Objection by complainant.) I do not think it is possible for the loss to what might be called riparian owners or appropriators to be as great by reason of the establishment of the doctrine of appropriation as would be the loss to appropriators by the establishment of the riparian doctrine. (Objection by complainant.)

Q. Speaking along the lines of benefit to the country as a whole, I call your attention to a paragraph in the message of President Roosevelt found in the volume referred to in your examination by counsel for Kansas this morning, and to page 86, which reads as follows:

"The reclamation and settlement of the arid lands will enrich every portion of our country just as the settlement of the
5369 Ohio and Mississippi valleys brought prosperity to the Atlantic States. The increased demand for manufactured articles will stimulate industrial production, while wider home markets and the trade with Asia will consume the larger food supplies and effectually prevent western competition with eastern agriculture. Indeed the products of irrigation will be consumed chiefly in upbuilding local centers of mining and other industries which would otherwise not come into existence at all. Our people as a whole will profit, for successful home making is but another name for the upbuilding of the nation."

Have your experience and observations over the whole country led you to believe that the results there predicted from the reclamation of arid lands by irrigation would be fulfilled?

A. I believe they would.

As a rule, in the arid region water will render its greatest service when taken nearest its source. The waters of the Rocky Mountain streams will serve the largest areas the sooner they are diverted.

Q. Will you give some of the reasons for that? (Objection by complainant.)

A. The first is that the natural channels of most of the
5370 streams are broad and sandy. The water spreads out over these broad channels in a thin sheet and the sands along the margin become heated during the summer months and evaporation becomes exceedingly rapid. Evaporation from a sand surface, with water beneath the surface so that it can become intensely heated, will be greater than from a water surface alone. By using the water near the mountains that excessive loss is avoided. Then on some of the streams there are considerable losses in the channel of the stream itself. The water sinks into underground strata and disappears. So far as any one can tell, it is absolutely lost. Those are the two factors which concern the volume of water which can be diverted. The other factor is that the products are more valuable nearest the markets because of the large local market there. There are centers of non-producing territory where there are large industries like mining and manufacturing, and health and pleasure resorts, that are consumers of products, and crops are more valuable because of less transportation charges.

Yes, it is true that by using the water near the head of a stream
5371 we get a larger use of the seepage or return waters by being able to capture them farther down. If any one were laying out a scientific system of distribution from a stream they would put the first right at the head of the stream and build ditches in succession right down afterwards so that each one would take what was left above without any interference with other appropriations.

Referring to my examination yesterday concerning the city of London taking water to provide for the necessities of the people that practically did away with the flow of certain streams in England, I would say that the extreme riparian doctrine was much better adapted to a country of that character than it would be to one of less water and less streams. Two of England's colonies or provinces—Canada and the provinces of New South Wales and Victoria—have abrogated the doctrine of riparian rights.

Q. What have they substituted in its place? (Objection by complainant.)

5372 A. The northwest provinces of Canada have adopted the doctrine of appropriation as it is recognized in the United States in Colorado and Wyoming—practically the same system of acquiring rights and of administering streams. The Australian provinces have some modification of this doctrine, because it was not inaugurated until there had been considerable settlement along the streams, before there was any water legislation. There they recognize as vested certain riparian rights, but in Victoria they were limited to five and ten acre plats along the stream. It only extended back a very short distance from the bank. There was a definite

limitation of what was riparian land, and it was a strip of five and ten acre plats.

At the time the riparian doctrine was adopted by the eastern portion of the United States, the conditions of life were such that there was no importance attached to any particular
5373 doctrine of water control or water ownership. But little water was used, and it was not regarded as—it had in reality no practical importance. (Objection by complainant.) It is true that in that part of the United States first settled the necessity for the use of water on land was very much less than in the newer portions which have been settled later, and that continues to be true even to this day. It is also true—in again referring to England and its practices—that in both India and Egypt the English government has recognized physical conditions as there existing and has expended large sums of money and has encouraged the development of irrigation projects and the conservation of water. (Objection by complainant.)

In referring to Intervenor's Exhibit 7, concerning which I was examined yesterday, I will say that it does not show all of the ditches in Colorado of which we have a record. We did not have
5374 time to place them on the map. Nor does it show all of the ditches in Kansas of which we have maps; and we know of other ditches in Colorado of which we have no description. I desire to place additional ditches on the map, and especially to add the locations of the head-gates of many of the ditches which will not be extended on the map, and even when that is done I will not have been able to represent on the map, by reason of lack of information, all of the ditches of Colorado. We have about fifty in the upper district along the tributaries and near the head waters of the Arkansas river, the existence of which we know, but of which we have no descriptions, and there may even be many others that we do not know of, and when we have completed the map as fully as we have the information upon which to complete it there will be small ditches that will not be shown, and these small ditches in the aggregate will cover a great deal of land and take from the tribu-
5375 taries a great deal of water. From my observation of that class of ditches and the class of irrigation under them in the high mountain valleys, it returns a large percentage of its water to the streams from which it is taken. The general belief along streams is that as a rule this diversion does not injuriously affect the river below; that the benefits which come from equalizing it compensate for the loss in volume.

5377 In using the term "duty of water" I use it as it is usually expressed. It means the area served by a given volume of water. The larger the area served by a definite volume the higher the duty. The more water used on a given area the smaller the duty.

Yes, a decreed right represents the maximum amount to which a ditch under the law is entitled. It does not always represent the

amount of water used. Frequently it is largely in excess of the amount used, and it is never a true index to the amount of water taken from a given stream to take the sum of the decreed rights upon the stream. I think it is the purpose of the law in Colorado that the actual rights of the parties using water from a ditch should be limited by the necessities of the land, if the question be properly raised. I have always believed that that was the proper construction of the statute. There have been decisions of the courts giving a different interpretation of it, but I have always felt
5378 that the courts were wrong. I have not read all of the recent decisions in Colorado, but some of them I have read I think tend to the doctrine that there must be read into every decree a limitation upon the amount decreed to the amount necessary for the proper irrigation of the lands to be served. (Objection by complainant.)

5379 In no line of industry with which I have ever had any personal acquaintance is an intimate knowledge of the conditions so necessary to secure efficient results as it is in irrigation. (Objection by complainant.)

In regard to my evidence concerning the expense of the superintendence of various ditches and canals, it was intended to include the management and operation of all ditches, large and small, but there was no record of the expense on a great many of the ditches. Now, that expense of superintendence and operation only includes those ditches of sufficient size to require some superintendence and to be included in the reports returned by the State officials. Of course it does not include those ditches of which there are no record, and it does not include a great number of small ditches which are never visited or any attention paid to them, and the statement of the amount expended in that work is under rather than over the real expense. The same is true of the next item—the cost of maintenance.

The figures I gave in reference to crops produced were
5380 only such as I had reports of, and these figures do not include all of the districts. There are some districts it does not include at all.

Yes, I have the correction of my statement as to the matter of sugar beets grown. I ascertained it last night in looking over the original documents and then have had it verified by telegram by the party who compiled these figures, that there was only 513 acres of sugar beets that were returned separately in these reports and of those that were returned separately the prices were inserted in this statement separately. In other cases the sugar beets were included in "other crops," of which there was 49,780 acres. That would include sugar beets and other things not specially reported. And all crops of that character—miscellaneous crops—$25 an acre in value.

5381 In regard to the reclamation act, I will say that I cannot see any other outcome but that the establishment of the ri-

parian doctrine renders hazardous the construction of irrigation works of any magnitude, whether it is constructed by private or public enterprise. (Objection by complainant.)

5382 The doctrine of riparian rights and of prior appropriations are antagonistic. (Objection by complainant.) They cannot exist together. One places no limitation on the places where water can be used and the other places rigid limitations. The methods of acquiring titles to water and the whole methods of administration are entirely different. It is simply impossible for the two doctrines to operate together in the same drainage area.

I think the general tendency under irrigation is to subdivision of the lands and to smaller holdings. That is more pronounced in some sections of the country than in others, and it is especially marked in California where irrigation is resulting in the breaking up of large estates and in the enormous increase in the population and in taxable and productive wealth.

5383 In referring to the seepage and return waters, especially in the valley of the Arkansas river, I will say that various tributaries coming into the river between ditches which took water from the river would necessarily make all of the return waters from a given ditch reach the river before passing the point where the tributary entered the river. It depends entirely upon the character of the tributary and the nature of the underground strata through which the water passes. The tributary might be a shallow one so that the water would pass under it without interference, or the water-bearing strata might be deep and it might pass under even a deep tributary without being intercepted. It is true that seepage

5384 or return waters do not alway get back to the immediate vicinity of the lands irrigated. It is not necessarily true that the mere fact that there might not be surface water flowing in the stream at a given point below irrigated lands is evidence of the fact that no waters ever return to the channel of the stream. Of course the tendency of seepage water is to follow the path of least resistance, and that as a rule is down the steepest slope, to get down to the stream in the quickest possible time; but there might be conditions that would overcome that.

5388 In referring to my evidence as to the abuse that has grown up under the selling of water, I will state that I believe there is a statute in Colorado providing that before the purchaser of a water right can transfer the place of diversion and use he must give notice to all who might be affected and establish in court affirmatively that the change of point of diversion and use will work no injury to any one else. (Objection by complainant.) But I am not familiar with all of the decisions in respect to that matter. Yes, it is desirable that in the proper utilization of water there should be some method of permitting the change from a less valuable to a more valuable use or place of use, but any changes of that character should be hedged around by such safeguards that a pretence that you are transferring from a lower to a higher use should not make effective

a right to water which could not be utilized under the original appropriation. There is the danger in water transfers. If you
5389 will hedge your transfers around so as to absolutely prevent the transfers from simply being a means of making effective a right to a surplus that could not be used under the original appropriation, you have done away with one danger. Originally, the transfer was for beneficial use and the place defined and the use defined; then you make a sale of the appropriation without the beneficial use being defined, and the water right becomes simply personal property and it can be applied to any use, whether it is a lower or a higher one than in the other place. That is where the abuse comes in. Yes, I see no objection to permitting the change in use if it is to as valuable a use or a higher one and is limited to the actual amount theretofore used by the seller and if it don't permit the acquiring of water rights simply as a form of property independently of any use or where you cannot place a measurement on them by beneficial use.

5390 If it be true that under the laws and decisions of the State of Colorado before you can transfer a water right the purchaser must give notice to all parties who could be affected and must prove that it will interfere with the rights of no one else, and must show that it is to be used for a beneficial purpose, and is limited in the transfer to the amount that has theretofore been actually used for beneficial purposes and not to a surplus, then I think that would be a safe-guard in a general way. (Objection by complainant.) In order to secure the highest duty of water it is absolutely necessary to shift from one use to another use to provide for growing necessities. Every city and town will have to reach out and acquire water rights far in excess of what they were using a few years ago, not only for domestic purposes but for the industries that go with the city. Those are things that cannot be anticipated, and they are absolutely essential to the growth of the community, and the
5391 transfer of rights to meet those growing necessities is, I think, wise, just as I would recognize the shifting of a water right for forty acres of land from an inferior tract to a tract of higher productiveness. It would also be proper under the views I hold to shift from a forty acre tract the water necessary to properly irrigate it to some other use, as domestic irrigation, or the irrigation of a larger acreage, provided that transfer was so safe-guarded that the purpose of the purchaser did not thereby enlarge the original right, and the only danger there comes from the mistakes in the original right. Those rights were established wrongly. If they had been scrutinized with sufficient care so that they would have represented the actual use in the first place, I would see no objection to that. I would see no objection to the principle of it at all.

I think there should be some consideration provided for in our statutes hereafter in reference to the fact as to whether water which had an older appropriator below would reach him without
5392 excessive loss if turned loose by a junior appropriator above. I think that is a provision that should be incorporated in our

water laws everywhere. (Objection by complainant.) But when it comes to its application to old rights, then it is a question of whether we can do it, because none of the States as yet have done it. The trouble is that everywhere there has been no consideration paid to waste. Take it in Colorado, take it in Wyoming, take it in Kansas or Utah or anywhere there has been no public supervision as to points of diversion or the kind of land on which water is used in order to get the highest service out of it. There ought to be such consideration and there ought to be such discrimination in issuing permission to use and divert water. But we do not exercise that inside of any State to-day; we permit wasteful use on the same terms as we do valuable use. That is a weakness in the administration of the doctrine of priority and of appropriation.

Q. Then if some of the courts of Colorado are by their decisions now taking into consideration the question as to whether water released by a junior appropriator will benefit a senior appropriator who claims it, they are working along the right lines for the purpose of getting the highest service out of the water, in that respect, are they not?

A. I think so.

Cross-examination on behalf of defendant The Colorado Fuel and Iron Company.

By Mr. BEAMAN:

5393 It is possible, of course, to have more loss in the channel of the river than you would have in the ditches that run through the country alongside of that river, so that the effect of these ditches in Colorado on Kansas would depend altogether on whether this ordinary flow would reach Kansas in the absence of
5394 ditches. I would not say that I am in favor of the obliteration of State lines in the administration of water for irrigation, but I believe it is inevitable. I believe that where you have conditions in two States that are the same, where both States are arid, where you have the same necessity for irrigation in both States, equity requires that the earlier rights should be protected and that the doctrine of priority of rights should be enforced across that boundary as though it did not exist.

Yes, the constitutions of Wyoming and Colorado recognize the State right of control of the waters. I would say this—that the act of Congress of 1866 recognizing local laws and customs certainly conferred on these States a very wide power in the appropriation and use of water. It certainly authorized them to set up any sort of a system for the diversion and use of water that they saw fit, and that provision is in every patent to land issued by the Federal Government. (Objection by complainant.) And I think the reclamation act rather tends to strengthen that doctrine. (Objection by complainant.) I do not mean it strengthens the doctrine that the State has the right to all the water, but to pass laws. You see the

statute of 1866 recognized local laws and customs; now the statute of 1902 also recognizes local laws and customs.

5396 No, my objection to the Federal Government's control of irrigation was based on other grounds more particularly than on account of the enormous number of men that would be required to do it, and they are necessarily unfamiliar with conditions in places where they would be required to act. That is, other reasons were more important, and they are these: First, that the streams where interference would be required at present or within a great many years are comparatively few; that while there are a great many rivers that are inter-state streams, there are also a few rivers where inter-state problems are likely to be acute. On a great many of the streams where an inter-state division is necessary it is likely that interference to secure a proper distribution will only be required for a brief period in any year, and in many years it will not be required at all; so that while apparently there is a large field for Federal supervision, when one comes to know the actual conditions the field is very materially narrowed. Now, that leaves, then, a large part of the territory of each State where the inter-state question does not arise at all. Now, if on account of the necessity for some Federal supervision to secure a proper division across State lines you introduce a general supervision by the Federal Government of rights, you apply it to a great many cases where it is not necessary on account of inter-state questions, where the issue is purely

5397 local. There are these advantages in continuing local control—that you develop capacity on the part of the people to solve their own questions and work out their own solutions; that there are local conditions in this arid region that make it desirable that there should be modifications in the methods of administering streams and distributing water among irrigators, and this is possible only so long as you will have a large measure of local control in the hands of the States. Of course it is possible, if the Federal Government should take charge, that they could appoint local men to take charge and thus have expert supervision; but the real reason is that there is so much of the territory where the States can administer it, where all of the issues, everything connected with it, is local in its character and in its interests.

Q. Now, going back to the State line question once more, for say twenty years the irrigators or the users of water in the mountain States in which the water originates has been inaugurating and building up enterprises on the theory that the acts of Congress and the constitutions of their States gave them the right to use the water as against some lower State; now, don't you think it would be extremely unjust to those people for the Government now to undertake to reverse that whole theory and distribute the water regardless of State lines simply on a question of the priority of some few appropriators or any number of appropriators in the lower States, to the deprivation of those in the State where the water orignated?

A. That is just an illustration of a general rule where you permit industry to develop without any proper system to govern it. When you undertake to introduce an adequate system it always works hardship to somebody, and I do not see any solution of these difficulties that will not work hardship to some one. It becomes, then, simply a question of what will secure the largest development and what will work the least injury.

5398 As to whether the establishment of the State line doctrine will work the least injury to the country at large, I will say that depends entirely on the locality. There are places where the establishment of the State line doctrine would undoubtedly greatly simplify irrigation development and work the least injury; on the other hand there are cases where the refusal to establish that doctrine would work such an injustice that I am sure it would

5400 never be permitted. But there is no question that both Wyoming and Colorado would be immensely benefitted by the establishment of absolute State sovereignty. There is no doubt that a great many problems of irrigation would be simplified by such a doctrine, but these two States are preeminently in a favorable position for the application of that doctrine; that is, as applied to water. I was greatly in favor of the insertion of that provision in the constitution of the State of Wyoming which confers on that State the control of its waters.

5402 It is true as a general principle that the Government reclamation projects the same as other irrigation projects in a general way would be more effective if they were built nearer or near the heads of streams than farther down in the arid region where evaporation and seepage would be much greater. But then opportunities for the securing of large areas of land are often greater away from the mountains, and that controls the location of irrigation or irrigable tracts of land. It is not always possible to get irrigable tracts of land to irrigate where the stream rises or in the immediate vicinity of the sources of the stream, and you have to go considerable distances away to get the land to irrigate—the land that has the slope. Yes, if a reservoir were made in the higher regions the river could be made to come to it to take the water to any place. But you see the Government projects do not stop with reservoirs; they include canals for the distribution of water, and those canal-, in a few instances at least, are built in States below where the water originates and where it is probable that storage in time will be resorted to. Take the case of the Snake river. It rises in Wyoming. The most desirable storage sites are in Wyoming. But the opportunities for utilizing the water that have been taken advantage of by the Government are all in the lower State—

5403 in Idaho. There is no obstacle in the way of negotiations with a State for the use of any surplus water in some other State, that I know of. Well, I would question whether if the State had control entirely of the situation they would be willing to surrender a resource of that kind for use elsewhere if there was any

possibility of its ever being utilized at home, even if the Government should attempt such negotiations or agreement with the State in which the water originated to store it there and take it out into another State.

The results of a large number of measurements show that about two-thirds of the water taken for irrigation under ordinary conditions is lost by evaporation and absorption by plant life.

Cross-examination on behalf of defendants continued.

By Mr. ROGERS:

5408 I do not think the decrees for any given amount of water are intended to give a continuous flow of water on a given piece of land to the extent of the decree without any respect to the beneficial use. It cannot be, unless you make beneficial use a travesty. You simply play on that term when you make it a right to a continuous flow, because there never exists any reason for such use. What I mean is that every decree of necessity, according to the rules and customs of irrigation, has read into it by implication that "this water is given to be used at the times when neces-
5409 sary," and that it expresses the maximum amount which may be taken at that time, and as I understand the theory upon which perpetual rights to water have been conferred, they are entirely usufructory rights. A man diverts and utilizes water for a specific purpose and he gets a right for that specific purpose. Without increasing or changing the right, I see no objection to a transfer simply as a transfer. The whole objection is based upon what takes place as a result of the transfer. Now, a right for irrigation is a right that only exists during a part of the year. It is not during that part of the year a continuous right to a uniform quantity, and in establishing these rights we have assumed that they were to be used in irrigation, and we have given the maximum amount that would be acquired at any one time. Now, as the right is intended to give the greatest quantity needed at any one time, it is a greater
5410 amount than is needed during a considerable part of the irrigation period. Now, if you change that right into a right to a continuous flow of that maximum quantity, by that change you very largely increase the right. You introduce there a large surplus that was not given in the first place. There is the fundamental objection to the transfer of a right for irrigation to some other right—that you entirely change its character. The evil of the process is that the next appropriator in turn is shortened in respect to his true supply of water. That is one thing. And you entirely change the character of the ownership in the stream. But the other objection is that so many of our rights have been established at a time when the procedure was lax and loose, when the true value of water was not appreciated, and so instead of giving what was the maximum requirement we gave a great deal more than that, and that is an

additional incentive to these transfers and to the evils that grow out of them.

5411 Yes, I have in several reports in calling attention to this stated that the highest price-farming lands in the United States were in the arid region. The highest priced farming lands in the State of Illinois—when the value is not affected by nearness to cities—with which I am acquainted sell for about $150 an acre; the highest priced farming lands in the Poudre valley in Colorado—not affected by nearness to cities—with which I am acquainted are selling for $300 an acre. Here you have practically the same climatic conditions and opportunities for growing about the same kind of crops; and where you come to certain sections in the arid region where fruit growing is possible the difference is still greater. Tracts of orange lands in California without a dollar's worth of improvements on them, without a house or fence or anything except the trees, have sold for $1,800, per acre, which is twice the value of any farm or fruit lands with which I am acquainted in the eastern half of the United States.

Recross-examination on behalf of complainant.

By Mr. ASHBAUGH:

If any corporation or manufacturing company could buy an irrigation right according to the decreed appropriations and then use the whole of that decreed appropriation continuously, as to whether they would not be changing the right itself and necessarily

5412 affecting the rights of irrigators below, I will say they would be changing the right, certainly. The question as to the effect on the water supply would depend entirely on the use made of it. Now, if you used it for a steam engine you would destroy it all, so that there you would injure the irrigator. If you should use it to turn a water wheel, so that it all got back into the stream, you would benefit the irrigator. It all depends on the character of the use to which you put it. But under such conditions you would entirely change the character of the right.

5413 Recross-examination on behalf of defendant The Colorado Fuel and Iron Company.

By Mr. BEAMAN:

Yes, I am familiar with the modern processes of large works where they use considerable quantities of steam and use also condensers by which the steam is condensed and returned. I know that is done. But if that is the case you do not require much of an appropriation. There would not be any incentive to buy an appropriation.

5414 Redirect examination on behalf of intervenor.

By Mr. CAMPBELL:

Q. Mr. Mead, in answer to a question propounded by counsel for the State of Kansas, you stated that the doctrine of riparian rights, and the doctrine of appropriation, existed in some of the arid States,—that is, in States that are partly humid and partly arid. In answer to a question propounded by counsel for the State of Colorado, you stated that these doctrines are inconsistent and irreconcilable with each other in the same water shed. Now, there might be an apparent inconsistency in those two statements, and I would like you, if you can, to clear it up.

A. I had in mind at the time of answering those questions two different sets of physical conditions. In the State of Washington, for example, the Cascade range of mountains divides the State into two entirely different regions, climatically considered; east of the range it is arid, and irrigation is necessary, and a statute recognizing right to appropriate the water of streams for irrigation purposes was passed. On the western slope of the Cascades it is humid, exceedingly so, and there is no question as to the existence of the doctrine of riparian rights. The doctrine of riparian rights has been recognized and sustained by the courts of the State. First it was applied to the humid side; subsequently it has been applied to the arid side. They have, however, legislation that provides for the appropriation of water. Now, there, apparently, those two doctrines exist, and exist on the same stream, but as a matter of fact one doctrine prevails in one part of the State, and the other doctrine in the other

5415 part of the State. Now, while in theory the riparian doctrine exists over in the arid portion of the State, as a matter of fact the water is taken out without respect to riparian rights, but it subjects those who do this to a constant anxiety and expense to prevent the enforcement of the doctrine. While it exists by virtue of a decision, it does not exist in actual practice. Now that is the situation there. That is the actual situation. It was enforced on one stream, and if any one goes there to-day, or as I was there three years ago, you can see four or five deserted homes in the country where the doctrine of riparian rights was applied, and the ditch that had been built, and was the foundation of those homes is abandoned. Now, the menace of that situation is as to when the riparian doctrine will be put into effect, and this year there was a commission, on which there were a number of very able lawyers, submitted a draft of an irrigation code, and in connection with that code they made an argument on that question as to whether or not they would make a division in the State running along the summit of the Cascade range. They regarded it as a matter of no consequence on the wet side, what doctrine prevailed. Water was a nuisance anyhow, and one doctrine would work there just as well as another; but on the eastern and arid side, they desired to have the doctrine of appropriation supplant the doctrine ex-

tablished in decisions, and which, by the way, overruled the
5416 statute under which the ditches were built; but they finally decided to make the doctrine of appropriation general in its application and to apply to the whole State.

In Nebraska the doctrine of riparian rights is not questioned at all in the eastern part of the State. You can say with perfect certainty that it prevails in the eastern part of Nebraska, because it is the sole doctrine there. But in western Nebraska, the appropriation and diversion of water has displaced the riparian rights doctrine, or had until recently. Now, in the recent decisions of the courts of Nebraska, it prevails in western Nebraska as well, but as a matter of fact it does not, because the streams of western Nebraska are controlled by a statute that was enacted with the idea that it overthrew riparian rights, as it in effect does overthrow riparian rights, because it places no limitation upon the diversions which can be made from the streams. Now, while the courts have sustained the doctrine of riparian rights, and made it general in application in the State, as a matter of fact the streams in the western part of Nebraska are being used and diverted in accordance with the law that provides for their diversion under the doctrine of appropriation.

Q. Notwithstanding the decision to the contrary by the supreme court?

A. No attention is paid to that decision in practice. Now, you might take every State where the two doctrines exist, and
5417 there is just the same explanation.

I am acquainted with the colony known as the Wheatland colony above Cheyenne, Wyoming. I know pretty closely the amount of money that was invested at the Wheatland colony at the time the water was appropriated from the Little Larimie, which has its rise and source in Colorado, and the number of people who are dependent directly and indirectly upon the waters of the Little Larimie. The doctrine as contended for by Colorado would make it possible to practically cut off their water supply at the Wheatland colony for late irrigation. It would very seriously cripple that community.

5418 Q. I will ask you whether or not the legislature of the State of Wyoming a few years ago authorized a suit against Colorado to be brought in the Supreme Court of the United States to prevent Colorado from interfering with the waters of these streams to the detriment of the appropriation in Wyoming?

A. Yes.

Q. And whether or not that act was signed by the governor of the State?

A. Now, in answering that I wish to explain my position with reference to the matter. There was an act appropriating money for bringing a suit on the part of the State against Colorado. I was State engineer at the time, and opposed the appropriation on the ground that the State had more to lose than it had to gain by the

establishment of that doctrine, and I did all I could to prevent the suit being brought, and along with others succeeded in preventing the bringing of the suit because of the belief that we were seeking to establish a doctrine that, so far as the State was concerned, would work more injury than it would good. That was entirely a selfish position as a citizen of Wyoming in seeking to take care of the interests of Wyoming. Now, that was my view, notwithstanding the fact that you have stated that the diversion of water in Colorado was working and could be made to work a very serious injury to the Wheatland colony. The water was taken over into another water shed, where there was no seepage return whatever. It is a
5419 complete loss to the people of the State. It is taken from the head of the stream, and it takes the low water supply, which is the most valuable, and the fact of the large expense made in Colorado to divert that water shows its value. Now, while it is true that this community was already injured at the time, and was threatened with very serious injury, my opposition was based upon the fact that Green river, which rises entirely within the State, has four times as much water as was involved in that controversy, that the Snake has ten times as much, and that the Big Horn has a great deal more, etc., and while so far as present development was concerned, doubtless it was to the interest of Wyoming to establish this doctrine, yet, looking at the ultimate possibilities of the State, the State would be better off if it could maintain the doctrine of complete control of that water supply.

Q. Your position, then, was a selfish position, with reference to the State at large?

A. That was my position, to take care of the State's interests. I believed then that justice to prior appropriators required the protection of their rights across State lines.

Q. Do you know that the supreme court of the State of Wyoming since that time has practically stated that that provision of the constitution referred to, giving the State the right to the water, does not mean that it can be taken to the detriment of prior appropriators in the lower State?

A. I do.

Q. Then, as a matter of fact, the governor, the legislature and the courts of Wyoming have repudiated the doctrine con-
5420 tended for by Colorado in this case, that the State has the right to take all of the water in the State to the deprivation of prior appropriators in the State below?

A. Yes.

(Objected to by defendants.)

A. (continued). I would say that in making that appropriation the State by implication surrendered State sovereignty. They could not claim from anybody else what they were not willing to grant, and so far as the decision is concerned, they have declared that the State did not have exclusive control.

Q. Now, you have said that the waters of all of the countries, particularly the arid countries, should be put to the highest use, and in this connection you said that domestic use was, in your judgment, the highest use, and irrigation the next highest use. In certain localities, might not the fact be that manufacturing has become a higher use than irrigation?

A. It is possible.

Q. Then when you have used the term throughout your testimony here that water should be put to the highest use, you did not mean that to be an absolute term, but rather relative, and that it should be governed by the conditions prevailing in different localities?

A. Yes. Nor did I mean that water could be taken from a lower use to a higher use without compensation for injuries wrought
5421 by such transfer. What I meant to say is this, that in the process of the development of the country there are new needs for water that are indispensable and must be provided for, and you must have a system of water control that will provide for meeting those needs.

5421 There is no question but that the Colorado Fuel and Iron Company is just as important an agent of prosperity in this State as an irrigated farm, as far as that is concerned.

I have here the approximate returns from eight canals in the Arkansas valley; and I will say in regard to the statement
5422 with respect to sugar beets that the greater part of the acreage of sugar beets was included in this term "other crops," and only the part of the acreage of sugar beets in which the value per acre was stated as separate from a number of miscellaneous crops were included in the separate item, and that is the way the 513 acres of sugar beets at $30 an acre came to be set off by themselves.

(Said statement of returns, being Intervenor's Exhibit 14, offered in evidence.)

This report was made from information which I received in connection with the office which I hold in the Department of Agriculture.

I hold in my hand an exhibit showing the acreage of the different crops grown in the Arkansas valley in Colorado in 1904, amounting, all together, to a total acreage of 345,000 acres. That
5423 is compiled in the same way, from the reports of the water commissioners and from replies to inquiries and investigations made by the Department of Agriculture.

(Intervenor's Exhibit 15 offered in evidence.)

I have made some investigations with respect to crop returns around Garden City, Kansas. During 1904 we collected and have certain statistics showing the yield and value of crops grown by windmill irrigation in the vicinity of Garden City, Kansas, and that was all prepared to be submitted in connection with this statement

(Intervenor's Ex. 15) of the crop returns from irrigation in the valley.

(Intervenor's Exhibit 16 offered in evidence.)

Recross-examination on behalf of defendants.

By Mr. HAYT:

5424 I think the legislation in Wyoming authorizing the commencement of that suit against Colorado and making an appropriation to pay the expenses of it was in 1895. I was then State engineer of Wyoming, and I was advised that the people of Colorado were taking the water from the Laramie river at that time. No, no suit was ever brought in pursuance of that authorization.

5426 No, it would not be difficult to determine how much water would be necessary to irrigate any 320 acres of land that are under irrigation. It would not be impossible, I will say, to determine what would be a fair equivalent for a right for 320 acres if you are going to change it into a right for a continuous flow, nor would it be difficult to determine the amount of water necessary to irrigate that land at the time that it is being used on the land by the owner. Certainly not. But the point is here—that under the transfers that have been made you have not succeeded in doing that. Well, you may have in some, but in a great many I have personally investigated, the result has been an enormous increase in the right, and that was really the moving purpose

5427 in the sale. Yes, if at the time of the transfer that right was determined by some court of competent jurisdiction or in some other way, that would eliminate the difficulty I have in mind, if it is properly determined. Now, if we say that you transfer a right simply as an irrigation right, then there is only one safe way to do that,—that is, the safest and simplest way is to say that we will shift a right to 320 acres of land to another 320 acres of land, and make your acreage of land the basis of the right; then you keep all the time the value of use. The trouble is that when you make these sales you establish that idea and you begin to deal with a continuous flow of so many cubic feet per second. If you are going to change it from a right that will vary from month to month with the necessities of the land into a uniform, continuous flow, you do not sell the right as it existed, but you have got to get an equivalent for that right that is something different but is a fair equivalent. It would not be impossible to do that, but it is a difficult thing to do, and we have not done it simply because we have not scrutinized this transaction closely enough to get at its real nature.

5428 Yes, the usual effect when you change from irrigation to some other use is that the change in the character of the use gives the purchaser a right to use the water for a longer period of time than that for which the original owner had acquired it. But if it be limited by the courts or by some competent authority to the

time for which it was originally used by the first appropriator, that would eliminate the difficulty I now have in mind and the objection to the transfer as to increasing the right would cease. The sale would not augment the right. Then the next question comes in, What is the object of the purchase? This water is a public property of great importance to the community. We in the first place gave these rights away. We gave them as a usufructory right. That only permitted these transfers, then, not with the idea of giving the men an opportunity to make money out of it as a property right which he never acquired, but in order to secure a higher and better use of the water.

5429 Yes, that is a matter that can be simply and easily brought about by adequate legislation and by the construction of the courts, but until you do that, until you throw those safeguards around transfers, they are going to be the most pro-

5430 lific source of abuse in irrigation. You must have the right kind of an administration and the right kind of procedure to carry that principle into effect before it is sufficient. That is what I mean in speaking of legislation. Of course the court could declare the principle. Ultimately the courts will declare the principle. But the State has got to protect its rights to water. That is what I meant by legislation. I have no fault to find with the principle, not at all. Safeguarded as you speak of, and if I was considering a specific method of carrying it into effect I would tell whether I had a doubt as to the result, but if I don't know what kind of agencies are going to carry it out, then I would have a doubt of the result.

5431 Some of these illustrations I have been giving have been based upon actual facts and occurrences that I have known of in the State of Colorado.

Testimony Offered on Behalf of Defendant The Arkansas Valley Sugar Beet and Irrigated Land Company.

DENVER, COLORADO, April 13, 1905.

5432 W. M. WILEY, Denver, Colorado.

Direct examination.

By Mr. ROGERS:

5433 I live at Holly, Colorado, and have lived there nine years in June. Holly is located on the north bank of the Arkansas river, four miles west of the Kansas line, in Colorado. I represent the Arkansas Valley Sugar Beet & Irrigated Land Company which owns what is called the Great Plains Water system, comprising five reservoirs north of Lamar, the inlet canals to them, the outlet canals,

and two direct delivery canals. I am manager of this com-
5434 pany. This company is distinctively a land enterprise, and has always been so. The water ways were constructed as an incident to the cultivation of the land.

I have a map showing the lands which have from time to time been acquired in connection with this enterprise. (Witness produces map identified as The Arkansas Valley Sugar Beet & Irrigated Land Co.'s Exhibit 1). This does not show all the lands that we acquired in Kansas, but it shows the lands down to the point where the Amity canal had engineers' locations fixed. The map shows the lands which were acquired in connection with this enterprise under the canal so far as constructed, yes, sir. There were lands of the company farther in Kansas that are not shown on this map. We owned at one time 105,000 acres of land in Kansas. The lands that the company from time to time acquired are shown on this map colored in red. There are about 90,000 acres of land appearing on this map, and of this number of acres 81,000 are in Colorado and about 9,000 in Kansas. In addition to this we have had about 95,000 acres in Kansas, located in Finney and Kearney counties. In Colo-
5435 rado we have acquired along the river, as riparian lands, through the whole distance of Prowers county, about forty-two miles. There are some few breaks where we do not own within this distance, roughly speaking, I should say about five per cent. which were in a high state of cultivation and which we could not acquire, but we have approximately along the river as riparian lands thirty to thirty-five miles, yes, sir. These lands not abutting on the river are immediately adjoining these riparian lands and a part of them. I know partly from hearsay and partly from the physical evidences which I have seen under what circumstances these lands were originally taken up. They were taken up in 1885 and 1887 by what are called in the country "rain-belters." The whole country showed evidences when I first went there of having been in cultivation. Where the prairie had been broken by the plow the evidences still remained, if it had not been put
5436 under cultivation since, and the cellars of houses and the debris that grows up around residences were there on every quarter section. The lands which we acquired were the lands that had been sought to put under cultivation by natural rainfall. The whole of western Kansas and eastern Colorado as far west as Las Animas was taken up by rain-belters as land which was supposed to be within the rain belt. The section of country in which our operations are, Prowers county, was almost solidly settled by them. These lands were almost entirely abandoned, or practically abandoned, by the people who first took them up. The only people who were living in the country of those who had depended upon rainfall were people who had settled in the bottoms of creeks or who had settled by water holes where their cattle could get water, but there was absolutely no agriculture in the country depending on

rainfall, nor is there now. These lands, therefore, could be
5437 made of no agricultural value with nothing but the rainfall.
The canals of our enterprise were constructed for the purpose of supplying the necessary moisture to the lands to grow crops; that is, the very lands which they had attempted to reclaim by natural rainfall.

The Amity canal is the largest of the canals of the company, of direct delivery, and judging from the marks which I found on the prairie by the original projector, it was intended to be constructed to the State line and to cover the 105,000 acres of land which we owned in Kansas. That would be about eighty miles in Colorado—I am talking now of canal miles and not miles as the crow flies—and eighty miles in Kansas, and the eighty miles in Kansas would carry it through the counties of Hamilton, Kearney and Finney, and would practically cover all the lands which our company acquired in Colorado and in Kansas, including this tract of approximately 100,000 acres.

5438 The Amity canal has now been constructed 110 miles—eighty miles in Colorado and thirty in Kansas—and it stops in Kansas between sections 28 and 27 in township 22, range 41,—the actual construction. The location has been carried farther and it has been operated to that point. It has been operated for the irrigation of Kansas lands; and I should like to state in that connection that the thirty miles built in Kansas has cost us more than any other sixty miles on the rest of the Amity canal, on account of the fills and the creeks we had to cross. The reason it has not been constructed farther into Kansas is that in the first place we learned that the economical way of irrigating land from a ditch was to irrigate first that land near the headgate of the ditch and later on land at a distance from the headgate, thereby developing from the head down. In irrigating the land in Kansas first we found that we were operating backwards, as it were, and thereby sustaining an enormous loss of water in carriage. We hoped that
as we got our lands nearer the headgate under irrigation we
5439 would have the water to put into Kansas. In order to overcome the difficulties that were presented, I was sent out by the owners of the enterprise from New York to make a report on what could be done to put under irrigation these lands in Kansas. I arrived here in June, 1896, and made an exhaustive examination of the water situation and recommended that while we had the water necessary in our direct delivery canals then constructed to irrigate the lands in Colorado, we would have to build reservoir systems to store the flood waters to irrigate the lands in Kansas, and at my instance surveying parties were sent out in every direction to survey for a reservoir site. The most exhaustive examination that was made for reservoir sites was made in Kansas, even on streams that do not appear to be tributaries of the Arkansas, with the hope of cutting through a channel. The White Woman and all the streams in Kansas that were any way near us were examined for this purpose. The reser-

voirs that were developed by us were the only feasible basins, taken from the different standpoints, which were found,—or probably I had better say the most feasible basins. They were the reservoirs know as the Great Plains reservoirs, located,—the southernmost edge is about twelve miles north of Lamar and the northernmost edge about twenty-five miles north. Yes, we finally located reser-
5440 voir sites in Colorado.

I have here a map which shows the locations of these reservoirs. (Said map is identified as The Arkansas Valley Sugar Beet & Irrigated Land Co.'s Exhibit 2).

(Said Exhibits 1 and 2 were here offered in evidence.)

By reference to our Exhibit 2, the reservoir sites which we selected in the southern portion of Kiowa county and the northern portion of Prowers county are about eighteen miles north and a little west of Lamar, Colorado. There are five of them. We found no reservoir sites in Kansas that were available. We had a reservoir site in Kansas, but not large enough for our purposes. The reservoir there is fully developed and has been used for irrigation purposes as far as its size will permit.

5441 The Arkansas Valley Sugar Beet & Irrigated Land Company's Exhibit 1 shows that that reservoir in Kansas is in the north half of section 25 and the south portion of section 24, 22–43.

The examination we made for the purpose of finding the reservoir sites and improving our water supply was made with the sole purpose of getting the water down into Kansas for the irrigation of the Kansas land which belonged to our enterprise. We understood at that time that we had direct water from the Amity and Buffalo canals to irrigate all of our lands in Colorado; and at that time we made inquiries as to the laws of Kansas which would bear upon this enterprise. At the suggestion of Messrs. Close Brothers and Co., our land agents in Chicago, I visited an attorney in Kansas City and had a long discussion with him as to the legal aspect of our water supply, in which he led me to believe that the Laws of Kansas were similar to those in Colorado as to protection for investments in water and its development. He so stated. He told me that the Kansas laws would fully protect us in any development which was made, either as to reservoirs or as to direct delivery canals, whether the canals headed in Kansas or in Colorado. Thereafter, upon
5442 the strength of this advice, I continued to prosecute the search for reservoir sites in Kansas, because we preferred to have the reservoirs as near to the lands they were to irrigate as possible, and also continued to prosecute the search in this State (Colorado). The main objection which we had at that time to the development of the reservoirs which we did develop was the long carriage of water from the reservoirs to the Kansas lands, and we spent a great deal more money than we probably should have done so as to feel satisfied that the search for reservoirs in Kansas had been exhausted before we developed the reservoirs which we did develop. In connection with

the reservoirs developed by us, we required, in the way of feeder canals, an enlargement of the Fort Lyon canal for, roughly, forty miles of its length, and the building of a very large canal called the Kicking Bird from the Fort Lyon to the reservoirs. This was necessitated because the reservoirs were higher than the Fort Lyon farther east from the point at which we diverted water from it.

5443 The Amity canal was a part of the irrigation of the Kansas lands, and the total expense in connection with that development was about $750,000. And this especially followed as an expenditure after these investments I have spoken of. After it was discovered that there was not sufficient rainfall to make these lands of which I have spoken productive, in western Kansas and eastern Colorado, a very complete system of irrigating canals was taken out in western Kansas, and they were practically contemporaneous with the building of the Amity. They were constructed in Hamilton, Kearny, Finney, Gray and Ford counties. Those are the only counties I know of.

The first location party of engineers for the Amity canal in Kansas had to live at the towns, and they were met by the citizens of the towns in Kansas with great enthusiasm, because it meant the development of their country. After that when our con-

5444 struction forces followed the engineers they were in constant touch with the towns and the people who lived in them, because nobody lived back of the towns then, and it was a matter of general notoriety and much self-congratulation that the work was going on. I was constantly receiving visits from those people and expressions from them of congratulation that we were carrying the enterprise out to the extent that we were. Then when the canal was operated there a large body of land was put under cultivation by renters—lands that we owned—and as the stock for all of that country was fed with the produce of these lands, later on, after the ditch had operated there for a short time, the seepage and return waters from the canal in its operation and from the irrigation that was carried on developed constantly flowing streams under the canal which had theretofore been dry. This water was used for stock purposes by the people and increased the value of their grazing lands, and in four or five cases small irrigation ditches were taken out of these otherwise dry streams to irrigate lands which we did not own. So that the matter for all of these years was of the greatest possible notoriety in that country as the only hope for agricultural development. (Objection and motion by complainant.) I

5445 suppose that at least thirty-three and one-third per cent. of the people who settled on our lands have come from Kansas. (Objection by complainant.) The town of Holly to-day, to the extent of ninety per cent. is composed of citizens who moved from Greeley, Kansas, bringing with them their houses and household effects. There are only about five buildings in the main town of Holly which were not moved in from Kansas on wheels. There is absolutely no farming that I know of being done in

western Kansas above the ditches that have been constructed there; that is, without irrigation. In fact, in driving over this country I found but few residences, one that of a Mr. Irving, a cattle man who lived by a water hole for his cattle to drink at, and the other an abandoned stone building of quite pretentious size, with very expensive stone outhouses, and upon inquiry as to why this had not been moved with the other houses I was informed that because it was stone it could not be economically moved.

5446 The Amity canal is 110 miles long—eighty miles in Colorado and thirty miles in Kansas—which comprises its present completed construction. The Buffalo canal is sixteen miles long in Colorado and eight miles in Kansas, or twenty-four miles in all as at present constructed. There are so many laterals I cannot give you the mileage of them. Yes, I can approximate them. I can give you an idea of them. Between the headgates of the Amity canal and the State line there are, under the Amity, fifty odd laterals, irrigating between 320 and 3,600 acres each. These laterals carry, in second-feet, from one to fifty-eight. They vary in length from half a mile where the lateral was taken out to irrigate the land near the ditch to 70 miles where they cover a large territory. For the first five miles of its length the Amity canal will carry 800 second-feet. It tapers down from that to the end, where it has about 350 second-feet capacity. The Buffalo canal has under it about twenty-five laterals, but they are less in size and in length than those under the Amity. The carrying capacity of the Buffalo canal is about 200 to 250 second-feet near its head, and it tapers down to about 100 at the State line and about 50 in Kansas.

5447 The real backers of the extension of the Buffalo canal into Kansas were the people located around Coolidge, who paid Mr. F. B. Koen a slight inducement to get him to build this extension; that is, for the purpose of covering the lands around Coolidge.

The other canals which are a portion of our system are the inlet canals to the reservoir, which first comprises the first forty miles of the Fort Lyon canal, which was enlarged by us. It begins at a point about four miles west of La Junta and stops at Gageby arroyo, in section 1, 22–51. From that point the Kicking Bird canal was constructed to carry our reservoir water to the point where the division for reservoir purposes is made, called Division Gates No. 1, in the northeast corner of section 28, 20–48; from that point the Satanta canal carries the flood to the Queen or Nee Skah reservoir. The main or Kicking Bird canal continues to Division Gates No. 2, in section 22, 20–48, where water is run into the Nee Gronda reservoir; from that point the Lone Wolf canal carries the water around the Nee Gronda reservoir into the Neoshe reservoir. These comprise the inlet canals of the reservoir system.

5448 The Fort Lyon canal through the portion we enlarged was built of a sufficient size to carry the water theretofore carried by the water users of the Fort Lyon for irrigation purposes and to carry ours in addition, and its capacity is something more than

2,000 feet. The Kicking Bird canal, which was constructed solely for our reservoir waters, has a capacity of 1,200 second-feet, and the total storage capacity of the reservoirs is 264,827 acre-feet; that is, these reservoirs would cover that number of acres one foot in depth of water. The reservoirs are located in two tiers, as relates to height or altitude. The upper three reservoirs have for an outlet the Comanche canal, which drops into the Amity canal at the Sand Creek crossing of that canal; the lower tier of reservoirs has as an outlet the Pawnee canal, which drops into the Comanche canal some twelve miles from the point where the Comanche drops into the Amity. The Comanche canal is 400 second-feet and the Pawnee canal 200 second-feet.

5449 When we were building these reservoirs in the fall of 1898 the National Editorial Association visited Colorado. The citizens of Prowers county, the Santa Fe Railroad Company and our company joined in an invitation to them to visit us and our irrigation system, and there were a large number of Kansas editors among that party. (Objection by complainant.) They arrived in Lamar and were drive- by the farmers to the reservoir sites, where construction was going on. About four hundred editors and their wives comprised the party who were driven out there. The system they were viewing and its purposes were described to them by some three or four orators of the day, and they then went out with this description in their minds to examine the work that was in progress. In going to the reservoirs and returning from them they crossed the Amity and Fort Lyon and also the Pawnee canal, and saw the Comanche canal, along which they drove for several miles.

5450 The physical appearances and expenditures being made were then all open to observation, and in addition to that the expenditures which were not within their vision were described to them, with the entire system of operation as contemplated. Many of the Kansas editors as a result of that visit published articles in their papers upon their return describing their visit and what they saw and the size, extent and purposes of the system, among which was the "Wichita Register." (Objection by complainant.) We received Kansas papers or clippings from Kansas papers and kept a carefully constructed scrap-book and made an effort to secure all of the mention made in the different papers of the United States in regard to that visit, to use it for advertising purposes in the future. (Objection by complainant.) This was noticed and described by Kansas papers to a very considerable extent. (Objection by complainant.)

5451 I have clippings from some four or five Kansas newspapers now in my possession, and I should say about four of them were from along the Arkansas river. (Objection by complainant.) We constantly had visits from people living along the Arkansas river or living in Kansas for the purpose of satisfying themselves that the development as proposed by us was really to be carried on. (Objection by complainant.) They came from Syracuse, Lakin, Deerfield and Coolidge. (Objection by complainant.)

No visitor from Kansas objected to what we were doing or proposing to do in the way of diverting the waters of the Arkansas river, but quite the contrary. (Objection by complainant.)
5452 By that I mean that the tenor of their conversation was entirely self-congratulatory, that the system would be constructed large enough to give them some of the benefits of it. (Objection by complainant.) There was no complaint whatever made at any time against the diversion of water for use in Colorado. (Objection by complainant.) We never at any time in the history of our development received any complaint in any way, shape or manner from any citizen of Kansas or anyone assuming to represent Kansas. I have an article here in this connection supporting us in some of our contentions in Colorado. It is an article in the Syracuse, Kansas, "Journal," edited by Henry Block, dated No-
5453 vember 25, 1898. (Objection by complainant.) The subject of the article was an editorial in the "Denver News." The article is as follows:

"This will be read with interest, as it sets forth clearly and specifically the Colorado side of the question."

I am not reading this in full.

"When the Amity Canal and Reservoir Company constructed the Amity ditch across the State line three years ago it had certainly considered every phase of that proposition. When its auxiliary corporation, the Great Plains Storage Company, took the initiative steps toward utilizing the great natural basins in the north part of Prowers county, for water storage, it had in its employ some of the brightest and foremost legal talent in Colorado, and it is only reasonable to suppose that every contingency liable to arise was considered from the highest legal standpoint. Knowing something of the great resources of these two great corporations, we have implicit faith in their enterprises accomplishing ultimately what they started out to do, viz: to reclaim their Kansas lands. They have been running water across the State line for three years through their own canal, and it will probably take the decision of a Federal court to dispossess them of that right. The two corporations have expended a million dollars in construction; are the lands in Colorado under their system of irrigation for which water is going to be demanded under the State constitution of an extent sufficient to enable the two corporations to earn a reasonable interest on their investments? If not, must the money put into the works be
5454 lost because of a petty dog-in-the-manger policy of Colorado, or will the courts hold that the Amity and the Great Plains people are entitled to earnings on their investments, and if they cannot find a market for what water the capacity of their ditches will carry at remunerative rates in the State of Colorado, then are they entitled to carry the surplus into the State of Kansas and use it here? These are only two of a number of reasonable contentions which can be advanced on behalf of the companies, and the "News" should give them due weight while it is standing up for Colorado.

In the meantime, Kansas will continue to irrigate with Colorado water—after you. It has never been understood down here that anyone in Colorado was to be denied water if they are under the ditch and have the price."

(Objection by complainant.)

I have kept in touch with the newspaper utterances in Kansas concerning this matter in the counties in the western part of the State on the Arkansas river. (Objection by complainant.) As to there being any utterances by the press denying our right to take the waters of the Arkansas river for the irrigation of either Colorado or Kansas lands, I would say that on the contrary the editors have particularly kept in touch with me by personal correspondence and have aided and encouraged me in our development, and the
5455 farmers who live under the canals of western Kansas have had frequent and constant conferences with me, encouraging our development and trying to make some arrangements with us by which they could command the return and waste waters of the system. (Objection by complainant.)

There has been invested in the enterprise which I represent about two and one-half million dollars. The farmers bought land and water from us at $22.75 an acre, the market value of which is now $75 an acre without improvements. There are about five hundred farmers under our system, whose houses and improvements on their lands would average $300 per family. The town of Lamar has increased from a hamlet of about 500 to the size of about 2,000. The town of Granada has increased from about 100 to 600 inhabitants; the town of Amity from nothing to about 400; the town of Holly from a population of about 4 to about 750. In Holly, Amity and Lamar, comparatively large, permanent and expensive struct-
5456 ures of brick blocks have grown up, covering the entire distance between the streets, and as the prosperity of the country has increased, expensive and permanent residences of stone and brick have been built. The whole countryside underneath the canal systems in Prowers county has increased more than a hundred-fold in school houses. Between the towns of Granada and Holly, where there was no population whatever, there are some ten or twelve school houses. In the towns mentioned there have been constructed enormous public grammar schools, and in the town of Granada an exceptionally fine high school building. Those in the towns are all of brick; the country school houses are wooden.

The effect upon this settlement and the development of which I speak if the Amity system should cease to operate (objection by complainant) would be that the country would be absolutely and entirely depopulated both as to the farming community and the towns, except insofar as the range, which is now badly eaten down, would support cattle men and they in turn would support the towns.

5457 I am familiar with the Arkansas valley, with almost every mile of it from the Kansas line to Cañon City, and fairly fa-

miliar with it as far as Dodge City into Kansas, and the growth in population and wealth in this valley is entirely due to irrigation and agriculture based on irrigation.

Among the larger enterprises in the valley are—the Rocky Ford factory of the American Beet Sugar Company, with a capacity of 1,200 tons a day, and an approximate cost of $1,200,000; the beet sugar factory at Sugar City, with a capacity of 600 tons a day and an approximate cost of $650,000; the construction of the Lamar sugar factory of the American Beet Sugar Company, with 400 tons a day capacity and an approximate cost of $450,000; a sugar factory at Holly, with a daily capacity of 600 tons and an approximate cost of $650,000; a large flour mill at Lamar, one of the largest in the State of Colorado, at an approximate cost of $400,000; a large flouring mill at Las Animas, at an approximate cost of $200,000; a large flouring mill at La Junta, at an approximate cost of $300,000; a canning factory at Manzanola, at an approximate cost of $5,000; a canning factory at Rocky Ford at an approximate cost of $7,000; a canning factory at Holly at an approximate cost of $5,000; in addition to which are a number of grain elevators which do
5458 not grind flour but handle the grain for farmers, the total cost of all of which would be about $10,000 to $12,000. I have left out any mills or elevators that may be located at Pueblo; that being a larger city, I am not sufficiently familiar with the different agricultural manufacturing establishments there to give a list of them.

We have an excursion over the railroad for land seekers twice every month. (Objection by complainant.) These excursionists are always taken by our general agents to the headgate of the Amity canal and the reservoirs north of Lamar. I do not think I have ever known a body of land seekers comprising one of these excursion bodies that did not have from one to twenty-five Kansas people in it.

5459 I have had visits on a number of occasions from people in Kansas who had called to see me as a part of a comprehensive examination of the irrigation in Colorado. I do not know of any excursions of Kansas people to Rocky Ford, but I do to other points along the Arkansas river that seemed to be especially successful. (Objection by complainant.) These excursions have been running about ever since I have been in the State, as a part of our colonization. There was an excursion from Arkansas City to Rocky Ford about two years ago. (Objection by complainant.)

5460 In order to make understandable what is meant by the system of irrigation as practiced in the Arkansas valley, I would like to describe conditions a little out there as differing from the East. I was raised in South Carolina, on a plantation, and afterwards lived in Maryland, and then in New York, before coming out here. I am familiar with the streams as they exist there. The streams of the arid region, as shown on the maps prepared by the Government, in Washington, do not exist. They are dry valleys

which show evidence that water has flowed in them. The prairie is like a piece of baked pottery in its natural state, and is impervious to rainfall. The rain, when it falls, finding the prairie impervious, runs off in a body practically without loss by absorption in the soil and goes down the side streams as well as the rivers in a torrential flood, lasting in some cases but a few moments and in others but a day or two. The irrigation of the country changes these conditions to such an extent that the water of the rainfall, instead of running off of a substance like dried pottery, is absorbed into it and is stored in it and is returned to the rivers and streams in a constantly
5461 flowing body, which changes what was heretofore a dry bed of sand into a flowing creek or river. The waters taken out of the river by irrigation in flood times and winter time are, with the rainfall, stored in the land, and this, added to the rainfall, increases the constant and steady percolation of the water back to the river and helps to make it a constantly flowing stream, whereas before it was a dry sand bed. The practice of irrigation, therefore, not only by the waters which are diverted from the river and put on the land, but by the cultivation of the land, which causes the rainfall to be absorbed into the soil, changes the conditions of the arid West to those almost exactly similar to the East in that it makes rivers and streams where none existed in the sense in which the eastern man understands a river or a stream.

We concentrate the waters of a given area upon a portion of the area and convert that into conditions similar to those where humidity prevails. I could, citing actual results, name, as at present, constantly flowing streams which, when I came to the country, were absolutely dry.

As to the storm or flood waters or those which are now valueless being used to a greater and greater extent, I will say first,
5462 the winter water of the Arkansas river is now as much used as any that flows in the summer time. The ditchers are as careful in watching the division of water according to their priorities in any month in the winter time as they are in any month in the summer time. This water is run onto the irrigated farms which have been prepared for it by plowing in the fall and is used practically for storage purposes in the land. When the floods come down, all of the canals on the length of the river and on the side streams carry their full capacity during the time of the flood, and that water is stored in the soil, which makes return waters later on. These are waters that otherwise would be allowed to go to waste, and not only to go to waste but to do great damage. The reservoir question has grown during my time in the valley to be the great question, and the different reservoir developments now take care of a large amount or a large proportion of the flood waters, which in turn return to the river and make return waters as the others do.

5463 When I arrived in Colorado the lower reach of the Arkansas river was dry from the middle or 20th of June until

the winter time. There was not a flowing stream that emptied water into the river constantly from the State line to Las Animas. The bed of the river was dry sand, and cattle could not be watered in the river without digging holes or wells in the river bed for them to get access to. There was no need of a bridge at Holly, and there was very little use for the one at Coolidge. I believe that ours was the first canal that began to operate 365 days in the year. The Amity canal was operated both winter and summer, and by that means more water was stored in the land than if it had only been operated in the summer time, and more land covered. At one place under our system we undertook to dig a well and found that to get water we had to go 120 feet deep. There is no place along the Amity canal today where water cannot be gotten within ten to thirty feet, showing that the water table has risen from 120 feet deep to within ten to twenty feet of the surface. This water table is like a lake constantly but slowly flowing through the soil to the river. This flow of
5464 underground water has changed the character of all the following streams from a dry, continuous bed of sand to the condition of a flowing stream which now never ceases to flow: Cheyenne creek; Wild Horse creek; Dead Man's creek; Buffalo creek; Bogg's creek; Cottonwood creek; Sand creek; May valley; Big Bend valley; Limestone creek; Gageby arroyo; Adobe creek; Horse creek. To such an extent has this flow been created, and of such constancy is it that from many of these streams irrigation ditches have been taken out by the local farmer for the purpose of irrigating his land. The amount of water discharged by the five first named creeks is so great that one of the great problems in the operation of the Buffalo canal is how to keep those return waters out of the canal so as to stop its use, as we wish to do in the winter time, and thereby reduce its cost of maintenance, because as the Buffalo canal covers only bottom lands, it is unnecessary that that should run during the winter time. More expensive headgates and dams have had to be constructed in the Buffalo canal to put these return waters in these creeks across the canal and keep them out of it. The problem presented in the operation of the Buffalo is therefore more how to keep this return water out of the canal than how to get the water from the river into it.

5465 The Amity canal irrigates a large area of land above the Buffalo, which causes these return waters to flow over the land through the creeks into the Buffalo. The consequence has been that whereas a bridge at Holly did not use to be necessary for the trade south of the river, for the last three years the town has been constantly losing its southern trade because the flow in the Arkansas river is so great and so constant that, if not absolutely impassable, the crossing is very dangerous, and the trade has therefore gone either to Granda, eleven miles west, or to Coolidge, seven miles east. In fact, it is necessary for the farmers living immediately south of Holly on the Arkansas river who are obliged to go to Holly, to drive either to Granada or to Coolidge to cross the river

in nearly all cases and for almost the entire year. To meet this condition, the State and county are now about to expend about twelve thousand dollars in the construction of a bridge across the Arkansas river at Holly.

5466 Our company has been compelled in two cases to pay damages because of flooding lands with our return waters along the river. One case was in May valley, near Lamar, and one was in the bottoms of Cheyenne creek, near the State line. The sources of the water which was doing this damage was the channel of the creek or the creek bottoms, and they were flowing toward the Arkansas river.

The distance from the State line to the headgate of the Amity canal, by the river, is forty-two miles, and taking that entire distance and the water that returns from our lands to the Arkansas river, the waters after they have returned go to Kansas. The condition of the river from the Amity headgate to the State line, or in fact to Dodge City and as far as I know to the contrary all the way down the river is that there is no permanent dam in the river below the Amity dam. The Lamar canal, whose headgate and dam are located about eight miles from the headgate of the Amity canal, and in which distance very little return water occurs, was in for one year and then was washed out. It has within the last winter

5467 been reconstructed, but that dam being so near the Amity dam, it would stop very little of the return water. Other than that, the return waters are only taken up, where they are attempted to be taken up at all, by temporary sand dams, which are not water tight in the first place and whose instability keeps them out of the river more than eight-tenths of the time. We take no waters out of the river for the reservoirs during the irrigating season, except in times of big floods. We do not take it out for the reservoirs at any other time than the winter season and the seasons of flood during the remainder of the year. We never store any water in the reservoirs that can be used for irrigation by anybody on the river.

Our records show that, commencing with the year 1898 and ending with the year 1904, a period of seven years, our average annual storage of water by months in acre-feet has been as follows:

January	5,701
February	2,118
March	601
April	3,090
May	5,674
June	22,878
July	7,028
August	4,792
September	1,080
October	4,316
November	1,160
December	5,376

Our total average annual storage in acre-feet has been 63,814; and in the seven years mentioned we have stored 446,698 acre-feet. That is, the total amount of water stored has been sufficient to cover 446,698 acres with one foot in depth of water. That amount of water we have spread over the lands under the Amity canal, less the amount lost by seepage and evaporation before the water
5468 reached the lands to be irrigated. During the seven years mentioned we have applied reservoir water to an amount of land averaging about 16,500 acres, and the average depth of the water, less evaporation and seepage, would be 3.88 feet. I can give you the number of acre-feet flowing in the Arkansas river at the headgate of the Amity during the past seven years, averaged by months, and the amount of water diverted by the Amity during said period, averaged by months, and from these figures it can be seen how much was taken when it did not interfere with the ordinary flow of the river. We keep accurate records, and the following table made from these records shows, first, the average monthly and annual discharge of water in the river at the Amity headgate; second, the average monthly and annual amounts taken into the Amity canal; and third, the per cent of the river water taken into said canal:

	1st	*2nd*	*3rd*
January	16,375	3,234	19.7%
February	13,333	4,577	34.3%
March	8,225	4,675	56.8%
April	29,148	2,841	9.7%
May	81,773	8,397	10.2%
June	129,881	13,872	10.7%
July	41,868	10,886	26.0%
August	41,833	8,973	21.4
September	7,528	2,474	32.8%
October	27,705	2,205	8.0%
November	8,470	6,674	78.8%
December	9,327	5,045	54.0%
Totals	415,467	73,853	17.3%

5468½ About one-third of the water that has been applied to the lands under the Amity has been taken out during the months of July, August and September.

Q. Now, I will ask you this question: Taking your method of operation, that is, the water that is taken during the winter season and at seasons other than when the ordinary flow is in the river, together with that which you take during the season of ordinary flow, and considering the amount of the water that returns to the Arkansas river before or after the river reaches Kansas, I wish you would state whether as much water is returned during the ordinary season—that is, during the crop season—as would have gone down during

the crop season if you had not taken any out through the Amity or Buffalo canals.

5469 A. The ordinary flow of the river at Holly, which is four miles west of the State line, is, to put it most conservatively, about a thousand per cent. greater than it was when I came there in 1896. If the Amity canal did not get the benefit of return waters from up the river, we would lose more than fifty per cent. in days and in the quantity of the water which the Amity canal now gets in irrigating seasons or in time of shortage. In 1896 the return waters to the river were so small that the river was a continuous dry bed of sand from the State line to Rocky Ford. As this water has been used on the lands above us for irrigation, it has supplied the river with a constant flow, which has enabled the Fort Lyon, the Amity and the other canals within that district to get the water which they needed, which in turn was put onto the land and has returned to the river. The same process which occurred above the Amity canal on the river has occurred under the Amity canal, so that at the present time there is always a good head of water in the river south of Holly, which makes the river practically impassable. By "practically impassable" I mean that the river is not always full of water, but there are so few days when there is not a big head of water in it that no one would drive to the river ford at Holly expecting to find the river passable. They drive to the bridges east and west of the town.

5470 Q. What I want to know particularly is this—whether, as you have operated your system, taking into consideration your storage of storm and waste waters and the carriage of water through the Amity during periods when it is not needed for crops either in Colorado or Kansas, and together with the water which you take during the growing season, you return by the processes of percolation to the river, for the benefit of Kansas, as much water as you take out through the Amity and the Buffalo canals during the months of July, August and September. (Objection by complainant.)

A. We return more. I would rather have the Amity canal in command of the flow of water which now passes Holly than to have it in command of the flow which is at the Amity headgate. I would get more water out of the river located with its headgate at Holly, and able to take the water that now passes Holly, than I do get through the headgate of the Amity canal, during the irrigating season.

Q. Now, what evidences have you, from your personal observations in Kansas, of the truth of your position—speaking now with reference to the canals and their supply of water east of the State line?

A. Up to the year 1900 the ditches in Kansas were to all intents and purposes abandoned, and agriculture existed only in some of the river bottoms. Practically no effort was made to keep

5471 up even the temporary and insecure sand dams. Weeds were permitted to grow in the ditches; laterals were closed

up; and the habit of thought of the people was that they could not operate their ditches successfully. About the year 1899 or 1900 a ditch with its headgate a few hundred or a thousand feet west of the Kansas line in Colorado began to take notice that the river was supplying a good head of water in such a constant stream as to make it available for irrigation purposes. While the headgate of this ditch is about a thousand feet in Colorado, the ditch is operated solely for the irrigation of Kansas lands; but it is the nearest ditch to Holly. They cleaned their ditch out and began the construction of said dams. The land under that ditch now is very valuable, and a very large proportion of it is under intensive cultivation. Noticing the advance that had been made in agriculture under that ditch, the other ditches began to be cleaned out and temporary sand dams put in the river for them. They found their supply of water constantly and rapidly increasing. The lands around Lakin, Deerfield and Garden City have since the year 1900 assumed the appearance in successful cultivation that the Colorado lands have around Rocky Ford and the more highly cultivated sections of the Arkansas valley. To put a measure on what they have accomplished,

5472 they grew in the season of 1904 500 acres of sugar beets with such success that for the present year they are carrying an acreage of something over 2,000, and nearly all of their ditches are now in proper shape to sustain a highly cultivated crop, and those ditches that are not in that shape are so not from a lack of water but from the intertia of the owners in waking up to the situation. I will say of this acreage I have mentioned Garden City has signed for 1,200.

Q. When I asked you whether you returned as much water to the river as a result of your total operations as you took out during certain months of the year, I intended to ask you what the loss of water was in the river between the Amity headgate and the State line between Colorado and Kansas if the water were allowed to flow.

A. About fifteen per cent., I should say.

Q. So that you are now speaking with reference to the fact that if the water were allowed to pass the headgate of the Amity canal 15 per cent. would be lost before it reached the State line, and what you make compensation for by your return water is that passing the Amity headgate, less the loss by seepage in transit?

A. Yes. I was considering the volumes of water at the two places exactly as they exist to-day.

Q. I will ask you, in view of your observation on that river, what you would say concerning the economical use of the water of that river, as to whether it should be first used near the mountains and so on in succession as you pass eastward.

5473 A. The use of the water near the mountains and from the mountains on down in succession changes the river from a sand bed to a flowing stream. The canals of late priority which in 1896 created no return water to the river because their lands at that

time had not been wet, have by the use of flood waters—and I say flood waters because the lateness of their priority only enabled them to take water at a time when the river was in flood—begun their return waters to the river, which, added to the return waters from the earlier canals, which can take water the year round, is changing the river into practically a flowing stream from which we on the lower reaches of the river now get our supply.

Q. Judged by your observation, has the condition of an increased return in late years been in any degree induced by the use of stored waters which formerly formed no part of the irrigation system of that valley?

A. Very decidedly.

Q. When did the use of these stored waters commence?

A. Well, there were some small storage basins in my early knowledge of the river in 1896 under the Bob Creek and Holbrook canals. Our storage system began in 1898. The Twin Lakes, which is up near Leadville, began in 1899 or 1900, I forget which.

Q. And as I understand you, it is since the reservoir system has been put in operation that the most marked changes have occurred.

5474 A. And these changes have been so marked that they have exceeded our expectations and those of our engineers who are experts in the matter.

Q. Now, I will ask you, considering the location of the land belonging to your company, or your enterprise, with reference to the river, by what right you claim to take water from the river for the irrigation of that land.

A. The first right under which we claim it is that of the riparian owner in the lands located along the stream of the river, and located to a very large extent in the bed of the river. The second right is that under the doctrine of appropriation.

Q. Do you take any more water from the river than is necessary for the purpose of making your lands riparian to the river fruitful and productive?

A. No, sir.

Q. Is the water which you take necessary for the purpose of making that land productive?

A. Absolutely.

Q. I will ask you one other question, inasmuch as it has been considerably discussed during this hearing: In what manner could any adjustment be made between the State of Kansas and the State of Colorado in respect to the use of the waters of the Arkansas river which would preserve in any degree the right to take water from the river in Colorado for irrigation purposes?

5475 A. The United States Government would have to take absolute control of the river from its rise at its head to the State line, together with control of all of the side streams, including the Purgatoire, to the Spanish peaks, and the innumerable side streaks flowing into the river west of Cañon City; it would

have to appoint its own water commissioners in the different districts now in force in Colorado, and to appoint its own superior officer who would have control of those water commissioners. I answer this as emphatically as I do, because during my management of the enterprise with which I am connected 90 per cent. of my time is devoted to seeing that the water is distributed in accordance with the decrees and coming into the closest contact with the machinery for that purpose, in addition to which my company is paying from year to year from $6,000 to $8,000 a year in the employment of men and their expenses in visiting different portions of the Arkansas river to see that we get our priority rights. The water commissioners are appointed by the governor upon the recommendation of the people located in the different water districts. They therefore feel a strong local interest, and each water commissioner tries to secure for his particular district as much water as he can, irrespective of the orders of the superintendent, who is superior to all of them and to the laws of the State. If that condition of affairs is true to the extent that we, located on the lower reaches of the river, cannot get a proper share of the water which the law gives us, it would be much
5476 more increased as between the State of Colorado and the State of Kansas; therefore it would be impossible to divide the water between the two States unless there were some strong head to say which ditches should be shut down to send the water down the river and who had the authority to close them down when he had said so.

Q. In other words, any scheme of division as between Colorado and Kansas would supercede and abrogate the police regulations which Colorado has adopted in respect to the distribution of the waters of the river?

A. It would so absolutely, because the control of the ditches on either side of the stream and in every water district of the Arkansas water shed would have to be under the control of this man appointed by the Government, so that he could say as to each one of these different ditches which one should be shut down to supply the river.

Q. I asked you about the lands in Kansas that lay beyond the end of the canal and to which the canal was intended to reach. I will ask you if this map (the Ark. Valley Sugar Beet & Irrig. Land Co.'s Ex. 1) shows the lands in Kansas to which you referred this morning as being beyond the constructed line of the canal.

A. That part of it showing east of range 40 shows that.

5477 Q. I will call your attention to the Arkansas Valley Sugar Beet & Irrigated Land Co.'s Exhibit 3 and ask you to state what that map is (handing same to witness).

A. It is a map of the Amity canal.

Q. In what year?

A. In 1890, showing its projection into Kansas and its relation to the Arkansas river, together with the lands through which it has secured a right of way.

The said exhibit was thereupon offered in evidence by Mr. Rogers.

Q. That shows the canal projected to what point in Kansas?
A. Projected to the easternmost line of range 41.
Q. That map was of the system prior to the addition of the reservoir system?
A. Yes, sir.

Cross-examination on behalf of complainant.

By Mr. ASHBAUGH:

I came to Colorado in June, 1896, and took charge of the Amity canal about a month later, and have been connected with it ever since. At the time of my first visit in June it was constructed almost to the State line. At the time I took charge of it in
5478 July it had crossed the State line and was being constructed in Kansas, and was actually constructed in Kansas, by canal mileage, three miles. When I came here in June, 1896, the Amity canal was being operated to Horse creek. Horse creek runs directly north and south of Holly, about four miles west of the State line. The entire length of the canal as constructed in Kansas was operated between three and four years, about the years 1897, 1898, 1899 and a part of 1900, and it has not been operated after that in Kansas or in a portion of Colorado. The eastern end of the Amity canal as now operated is Horse creek, to which I just referred, and which is about four miles west of the Kansas State line. I would like to say that we are beginning this winter to operate to the Kan-
5479 sas line again. Yes, sir, our system at one time owned something like 105,000 acres of land in Kansas. At the present time we own practically none. We began to sell it or dispose of it in the winter of 1900–1901. We sold it all in a bunch, because of the practical difficulty of irrigating a body of land so scattered and where the farthest portion of it was so far away from the headgates. We ceased operating the canal in Kansas because we could not carry the water at that time. We do intend to operate the canal across the State line in Kansas. We are making our arrangements now to operate across the State line, because we had to back up and start over again after our lands had been wet, and, as I explained before, increase as we could and not begin to irrigate at the end of the canal and come back to the beginning, but to irrigate near the headgate first and irrigate lands continuously toward the tail of the canal. Our reservoir system has also affected that very materially and would assist us very materially in going on down farther
5480 along the canal line. I may say in this connection that we can run more water in the reservoir system through an older ditch that has been seeped up than we could when we first began; that our banks are now more solid because of having been wet and our system carries water better, without evaporation.

The Kansas City where I spoke of consulting an attorney was Kansas City, Missouri. Close Brothers and Company had been operating as land agents in Kansas for a good many years, and he was their Kansas attorney. They were both lenders of money and sellers and controllers of land, and he was employed by them as a Kansas attorney, which I understood him to be, although his office was in Kansas City, Missouri.

The three canals that compose our system that take water out of the river directly are a portion of the Fort Lyon canal, the whole of the Amity and the whole of the Buffalo.

5481 In running a line from our reservoirs to the river we crossed the Fort Lyon canal with the grade that we wished to have at Gageby arroyo, and under the advice of our engineers, instead of continuing our line to the river upon the grade which we wished to maintain, we opened negotiations with the Fort Lyon Canal Company to permit us to enlarge their canal for storage purposes, the reason being that while the law of the State gave us the right to enlarge our water way for our purposes, we preferred to go in with their permission and consent than to do it arbitrarily; and it can be practically stated that that part of the Fort Lyon canal which we created is ours. As to the carrying capacity of the Fort Lyon canal as we found it before we enlarged it, I will say there has been varying testimony upon that point. My personal examination was that when the canal at flood time was carrying 761 feet it was all they dared to put into it, and I followed the canal down to the headgate to see how much water it would carry or

5482 whether that 761 feet was its limit. I found that 761 feet strained the canal very much beyond its point of safety, so that could be considered to be its extreme carrying capacity at that time. At the present time it will carry something over 2,000 feet through that forty miles through which the enlargement runs. From that point on we have the Kicking Bird canal, so that our part of the Fort Lyon canal and the Kicking Bird canal make one continuous canal from the Fort Lyon headgate to the lower end of the Kicking Bird canal. The original Amity canal was dug before I came here and was dug in 1887. It is hardly fair to call the work that was done by us a completion, because we changed the line of the canal to get a better alignment, and there are many places in the canal where the old canal is still left. We practically

5483 built a new canal, and while we followed it near the head we changed its alignment to get a better fall. That was completed in 1896. The enlargement of the Fort Lyon canal was made in the winter of 1896–7. It was constructed in sections originally. Without referring to the State engineer's report I cannot give you the dates. The Armentrout canal was constructed in 1884. That was a very small canal and amounted to very little. After that a canal was constructed by contract with the water users of the Armentrout to Horse creek, upon which a priority was gotten. After that, the Arkansas River, Land, Town & Canal Company

took over the canal to Horse creek, which was called the Haskell ditch, and constructed a canal to Gageby and stopped there for a while. After that the canal was continued to a point north and a little east of Lamar, called the Prince reservoir, where it stopped, making it 113 miles long. I think it was completed, as established by the records, in 1887, some time in the late spring. If Mr. Henry in the year 1886 began the Fort Lyon canal, it was what was called the Haskell canal, which was the second portion of those
5484 sections. The date of the Amity appropriation is February 21, 1887. The total capacity of our canals taking water directly from the river is about 2,000 second-feet. The capacity of the Amity is 800 and of the Buffalo 200. The only canals that will carry for any distance the amount of water which they will carry at the headgates are the inlet canals to the reservoirs. We could carry a thousand feet to the reservoirs, but we could not carry 800 feet in the Amity five miles, nor could we carry 200 feet in the Buffalo canal over three or four miles. A feeder canal is valuable only to the extent that it can carry water to its tail-end, which is the location of the reservoir. In a direct delivery canal the canal is built large at its head, in the first place to enable you to carry a large head of water to sluice out the sediment and deposit that naturally occurs there through your waste gates, and for the second reason, it is built larger at the headgate because as you irrigate the land coming toward the tail of the canal, the demand for your carrying capacity lessens, for the reason that at the head
5485 of the canal you have to carry water to irrigate all of your land, and as your land is irrigated going toward the tail the amount of water required is less. It decreases in proportion to the land that lies next to the canal as you go down.

The Buffalo canal was constructed in 1885, I think, and was eventually completed about twenty-five miles long, about eight miles of that being in Kansas. It was operated in Kansas one season, which I think was in the year 1898. I will not be absolutely certain as to the year. We did not own any lands in Kansas under the Buffalo canal. Some water came down Cheyenne creek, and the Kansas people were to look out for the ditch by agreement with us. They were not accustomed to the operation of a ditch, and when the water came down Cheyenne creek it filled the Buf-
5486 falo full. It ran down the streets of Coolidge and they thought there was another flood on foot, and instead of turning the water off, which they could easily have done, down in Cheyenne creek, they sent ten or twelve messages from Coolidge to Holly asking me to turn it off, and I told them that as it created so much excitement we would just drop it. That is the reason why we ceased operating in Kansas. It would not have paid us to have operated in Kansas, because we did not own enough land there under the ditch, and we could not have bought it at fair prices. We might have sold the water, but the complication of the Kansas State line would have made the thing we sold extremely indefinite—

not so that it was a purchasable commodity, probably. As to having difficulty in operating across the State line, I won't say that exactly, that we had difficulty in operating, but the man in Kansas would expect us to say to him what water he should get in proportion to what was in the canal, and while we were ready to deliver water to him, we were not ready to say to him what proportion he should get, and we did not know how the great States might think about it. We certainly do intend to extend the Buffalo canal into Kansas again, and continue its operation down there. The
5487 best prospect for development of agriculture that I have any knowledge of in this country to-day is in western Kansas, and the people have within the last few years waked up to the value of irrigation and the crops that can be grown by it, and we look for a large profit from the operation of the canal in Kansas.

As to the profitableness of winter irrigation, I will say that one winter irrigation is worth, in my judgment, three irrigations in the summer season. It is decidedly as valuable or more valuable to saturate the land in winter when there is no crop upon it than it is to irrigate the crop directly in the summer, and this prepares the land for the spring crop, whenever the spring happens to come. To explain that, the moisture which is put into the soil by either rain or irrigation is brought again to the surface by capillary attraction and is evaporated by the winds. If after an irrigation in the winter the farmer is careful to go over his land with a harrow so as to
5488 create a mulch and break the pores of the soil through which capillary attraction occurs, his moisture is conserved in the soil until the time when he wishes to use it in the spring. If he puts the water on the land either in the winter or summer and leaves it just as it was when the water went into it, the winds drive the moisture out of the land and the sun bakes a hard crust on top of it and his land has been very little benefitted from an agricultural standpoint. That irrigation only tends to raise your water table and really leaves your land in worse shape. I started in the winter irrigation in the Arkansas valley from having read in a Government report on Water and Its Supply a statement by a man in Kansas as to the value of winter irrigation.

Our canals are operating every day in the year, and the ditch riders are employed the year round. In this last statement I was not referring to the Buffalo but did refer to the Fort Lyon, the Kicking Bird and the Amity. Under the Amity canal, which is run purely for irrigation, we employ men to go among the farmers and encourage them to get out in the cold winter and apply the water to their lands, and we run in the canal all the water which we can get them to use, and sometimes more, and waste it down at the tail of the canal. On the Fort Lyon and Kicking Bird canals the
5489 winter time is the great harvest time for our water and we of course operate that the year round through blizzards and cold weather, under conditions which have never been attempted before. In fact, I think I can say that no canal in the West has ever

tried operating through the winter time without ever stopping until ours did. It was considered to be impossible. Yes, sir, during these times when there is water in the river we take as much in these two canals as we can find use for. The winter run never goes up to the full capacity of the canals, any of them. No, sir, we have never been able to fill all of our reservoirs. Our inlet canal was built upon the conclusions which our engineer arrived at from insufficient data of the flow of the river during the winter time, and the length of the flood season, and the inlet is not as large, therefore, as it should be to fill the reservoirs within the short time the flood lasts in the spring. Yes, sir, during the winter our carrying capacity is greater than the amount of water that we really get. Yes, sir, we
5490 find it profitable to take during that season all that the river will give us, and even then we have not been able to fill our reservoirs. Yes, sir, during these floods when we take the water that we find in the river we use the full carrying capacity of all three of the ditches. In the year 1900 the river kept up to such a height that we used the capacity of our inlet canals to the reservoirs until some time in July—practically constantly from February until July. It got so wet we didn't use it in two of them. It was a very wet spring. Ordinarily speaking, the regular flow of the river gives us a full ditch for not more than a week or two. Yes, I remember that in 1901 we had a very fine supply of reservoir water, but I cannot remember as to that year as to whether we got any during the winter time or from the flood. The spring of 1902 found us with a small supply in the reservoir. The amount of water was up
5491 to our carrying capacity while the flood lasted, very much more than our carrying capacity, because that was a very big flood. It lasted rather a short time than a long time, but was very heavy. The year 1903 was an ordinary year as to floods. Oh, yes, the supply in 1903 was equal to our carrying capacity, and we had, spread out through the season of 1903—and of 1902,—a succession of small floods in the eastern end of the valley which did not reach far enough up the valley to get into our inlet canals. These floods were all rainfall floods. No sir, we did not get any rise in the river down as far as our canals from the melting of the snows. I have never found any effect of the snow on the river that we have any control of. It is a matter that is usually talked about a great deal in the newspapers, but it has never helped us any. Our waters come from irrigation and from rains on the Arkansas river and the
5492 side streams. I have not the information as to the average rainfall in Bent county. In Prowers county it is ten to twelve inches.

Yes, sir, when I came out here in 1896 the land along the river had been broken up but had gone back to the sod again. It was in sod then. And in that condition you can say that practically all of an ordinary rainfall would run directly into the river. Yes, sir, after our lands have been broken up and we have gotten them into a high state of cultivation the rainfall is very largely absorbed and

finds its way down through the land into the river. I hardly think that you can say that it is so largely absorbed that none of it runs off as it did years ago, but the rainfall increases the flow of all of these streams now to a certain extent. A large percentage is absorbed that was not before, but you can always see a perceptible rise in the stream when there is a rain along it, and enough of that that falls right near the stream would run immediately into the stream so as to make a perceptible flow. Yes, sir, we have used a
5493 large amount of water on our lands because we have maintained a systematic plan of colonization and have had people there to use it. The returns which we have received have probably been less in proportion to our investment than those of any other company in the Arkansas valley. One of the reasons for that is that we have done our work thoroughly and we made a large investment at the beginning, carrying charges which—including taxes, maintenance and interest—have been heavy, and because it has cost us so much money for legal services and in watching the river to get our priority rights down the Arkansas river.

I should like very much to say that we have been able to get a large yield per acre from our lands that have been irrigated, but so many of our farmers have come to the country new to the conditions that the older irrigation experience which farmers have around Rocky Ford and in that section of the country have given them better returns with even a less valuable water supply than our
5494 farmers have gotten as a general thing. The older farmers of our country have made the returns which you think of, but the new men, it takes a long time to educate them to do the things thoroughly that are necessary to be done on an irrigated farm, such as I referred to just now in mulching the land to save the moisture.

Yes, sir, we have the gravest trouble during the summer season in getting a sufficient supply of water for our needs. It begins with the necessary spring irrigation in March, April and May. It is relieved during the flood season, which lasts for about a week or ten days in the early part of June. It begins again about the 15th of June and lasts straight through the season. Yes, during a good share of the irrigating season we get as much as we really need; I get it, but I have to fight for it. Yes, we have enough during the irrigating seasons to supply our needs, coming directly from the river, and we have more every year. The difficulties that I spoke of being very grave are the illegitimate diversion of
5495 the water farther up the river. I mean by this a ditch or ditches junior to the Amity taking water out of the river ahead of the Amity. There is a constant tendency in those ditches to take their full capacity when perhaps they could get along with a less amount, and because they have the color of taking what water they have a right to under the law, I pay very little attention to them, because my knowledge of the use of water is such that I feel sure—and conditions have proven—that when they take the water

out of the river and run it above their land in a ditch, even if they do not use it, the land will go to seepage and become valueless and the water will become so stored in their land that it becomes a constant feeder to the river at all times; but I regret to say that after this has occurred and the lands under these ditches with early priorities have become useless there has been a tendency to take that water and sell it to cover a new body of land or a new use to our detriment and loss. I do not say I think this has grown into more than a tendency, sir, I know it. The loss which the
5496 river has sustained by carrying out a new and greater use of the water has been enormous and has been sufficient to affect very seriously the amount of water that subsequent appropriators had a legal right to. Since you are interested in that, I will say this: The early ditches were taken out to cover the bottom lands, which required a very small amount of water for a very short period. The bottom lands were more liable to go to seepage than the uplands. So that while the law provides that a man shall not take out of the river any more water through his headgate than he can make beneficial use of, I have instructed the men who watch conditions on the river to pay very little attention to these ditches, because, the water having soaked the land, it will come back into the river, and the actual loss which the river sustains by the taking out of this water amounts to but very little. When that water is sold to go into a canal which goes back on the mesa, we then have to wait a series of years until the water table under that canal has raised sufficiently to make that a feeder to the river, and we object to having to wait that number of years and in the meantime to sustain-
5497 ing that loss. There are quite a number of other losses that we sustain by the sale of water. If priority No. 1 is located at the same place in the river as priority No. 2, priority No. 1 will command a reach of the river above it and take all of the water which arrives at that point and will use it to soak its land up, leaving priority No. 2 dry. If priority No. 2 has its point of diversion changed to where priority No. 3 has had command of the river and its return waters,—and you must understand in this connection that the return waters flow into the river by the mile and that if a canal can command a certain reach of the river it commands all of the return waters in the river for that reach,—that is, commands it in the sense of a superior priority. Now, canal No. 3 will have its lands wet and soaked up, and will be an important feeder to the river in the matter of return waters. Canal No. 2 changes its point of diversion from where it could not get water by reason of the command which canal No. 1 had over it, and goes down on the other side of the river where it can command No. 3 and takes No. 3's water away from the land which had been soaked up and begins to soak up the land under No. 2. No. 3's return waters stop coming into the river and No. 2 goes on and wets up its land, for which we have to wait. So that any change in the point of diversion can be said in a gen-

eral way to be made for but one purpose, which is to increase the duty of the water and therefore to lessen the flow in the river.

5498 Yes, sir, it is true that if priority No. 1 has more water under its decree than it actually needs, and sells the surplus, and has a right to sell it, he may sell it to someone who has a subsequent appropriation and might defeat priority No. 2 or No. 3. This takes place often, and always to the detriment of the other appropriators.

No, sir, during the time that I have spoken of when we had the water up to the carrying capacity of our ditches, we paid no attention then to the amount of the appropriation. That is always waste water. That is waste water in the sense that there is so much that nobody can use it all. That is also true of the other ditches through the valley. Yes, sir, this is simply limited as to time by the amount that you could use, and in amount by the carrying capacity of the ditches. Yes, sir, I stated that about one-third of the amount of the water that we get is taken out of the river in July, August and September.

5499 No, sir, this is not the time that there is the greatest need for it. The greatest need is in May and June in our country. In the Platte country it is different. During the months of July and August, after the rise of the spring has subsided, there is not a great deal of water in the river that we can get, and it is true that the amount of the flow of the river during the months of July, August and September is so small that many ditches cannot be supplied. That is practically true every year. It was not true in 1902, 1903 or 1904. As to a comparison between 1903 and 1904, my engineers told me that in 1904 there was a better flow of water in the river, from an agricultural standpoint, which impressed it upon my mind more than the other. 1904 was the wettest. If you take the two big floods which we had in 1904, it is fair to say that more water went down the river than in any other year.

5500 Leaving out the floods, 1904 was not as wet as 1900, when I told you we ran the water for so long a time into the reservoirs. It was much wetter than 1902, but ranked with 1903.

The amount of water given us in our decree limits us to that which can be taken into our headgate ahead of any canal which has an appropriation of a later date. In other words, it is exactly correct to say that if there was a canal with a subsequent appropriation that was demanding water, the Amity would not be allowed to take more than 283.5 cubic feet at that particular time, but if they were not demanding it we could take any amount that our carrying capacity would permit.

Yes, sir, I spoke about riparian lands, and that our system founds one of its rights to the use of its water upon the riparian doctrine.

5501 When a man has got as large an investment to be responsible for as we have, he needs all the foundations for it he can get, and I am going to take advantage of all that they give me, either here or elsewhere; but our appropriation doctrine is the

one upon which we demand our water during these fights you talk about; but we will very naturally employ either of them that helps us out. If I lean on one stick and it breaks, I will get another crutch. Investment in irrigation has not been a profitable one under any conditions, and it would seem that anything to make it less profitable to the individual and frighten him away is grasped at by the country at large with avidity, while they go ahead spending millions of the people's money in ventures that they discourage other people from going into.

Yes, sir, I stated in my direct examination that the total productiveness of the lands of our system is derived entirely from irrigation. Those lands were entirely arid before they were irrigated, producing nothing excepting the ordinary arid vegetation, such as sage brush and a few such species of vegetation.

5502 I am not prepared to answer the question as to the date of the Garden City ditches. I have tried to get sufficient data as to when those ditches were constructed, but I have been unable to get it, but to the best of my information, when I got to Colorado they had been constructed but were not in operation.

As to the question as to whether the Amity's system was constructed with the knowledge that the Garden City ditches had already been constructed, I will say that it will depend somewhat upon what you mean by the word "knowledge." I have lived in Colorado for nine years without ever having been able to get any definite knowledge about the Kansas ditches. I have made visits to Kansas for the purpose of acquiring a knowledge, but failed to get it. I knew the ditches were there, but as to any specific knowledge about

5503 them, I could not get it, and do not know to this day where I can go and get a record of the ditches with the priorities that have existed or what they have done. There is a general talk of an indefinite character that I can get from everybody, but whether the people who constructed the Amity canal did it with a knowledge of what existed there or not, I do not know. But when I came here the Garden City ditches had been dug, and that fact was known. Yes, sir, I know of a reason why the Garden City ditches cannot be made or could not have been made in the past successful excepting that they did not get water enough. I have addressed two meetings in Kansas within the last month urging and begging them to develop and operate their ditches and pointing out the advantages that would accrue to them from doing it, and while there were ditches in Kansas there never have been ditches in the sense that they were able to take the water out of the river when it was there excepting in flood times, and there are none there now that can do it. There never has been a dam in the Arkansas river below the State line that I have ever been able to get any knowledge of.

5504 Yes, there are a number of ditches in Colorado that have no dams, but they cannot take advantage of the water that is in the river. I should say that those ditches were not reason

ably successful. The Amity dam certainly was the finest dam on the Arkansas river, at any rate it was constructed to be the best dam on the river. No, sir, I was not in the country during the '80's. But no ditch in Colorado can demand more water than is at its headgate, because the water that is at its headgate fails to go into the ditch. I don't know how successfully the Colorado ditches were operated during the '80's.

Redirect examination.

By Mr. ROGERS:

It was one of the factors at the time the idea of reclaiming and selling Kansas lands was abandoned and the reclaiming and selling of Colorado lands was continued that in view of the fact that lands in Kansas were somewhat discredited it was believed that if we described the lands as being in Colorado rather than in Kansas
5505 we could get a better price for them than we could in Kansas. That was at a time when Kansas investments were generally out of favor throughout the country. It is true that water enterprises become more doubtful with respect to the sale of water rights as you approach the region where it is possible in one or two out of a series of years to make a crop by rainfall. That is one of the troubles with irrigation enterprises in Kansas, that they have gotten near the border line. The farmer needs a certain amount of education to realize the value that will accrue to him by the expenditure of the money necessary to insure him his moisture. That is a matter of actual experience along that river, yes, sir.

Testimony on Behalf of Defendant, Colorado, Continued.

GARDEN CITY, KANSAS, May 1–2, 1905.

5506 HENRY BLOCK, Garden City, Kansas.

Direct examination.

By Mr. GREGG:

I am forty-five years of age and am engaged in publishing a newspaper in Syracuse, Hamilton county, Kansas. I have been register of deeds there for four years, and postmaster for four
5507 years. I came to Hamilton county on February 2, 1886, and located in the town of Kendall, and I published a newspaper and remained there until 1889 when I removed to Syracuse. At the time I resided in Kendall I owned a half section of land on the south side of the river midway between Kendall and Syracuse, and it bordered on the Arkansas river. Kendall is also on that river. There were 304 acres of that land—a half section except that which was cut off by the river. I bought that in 1888 but did not irrigate

any part of it from the Arkansas river. Later I took up a
5508 claim, in the summer of 1888, on the north side of the Arkansas valley, about a mile and a half north of this land that I owned on the south side, and afterwards there was a ditch constructed across this claim and I irrigated that claim of 160 acres.

Yes, I casually noticed the flow of the water in the river from 1886 to 1889, and it was pretty much at that time as it is now. We had floods at certain periods and we had periods when there was very little water in the river, and there were times when there was no water flowing in the channel of the river.

There was a ditch built that was taken out of the river about four miles west of Syracuse in 1889. It was called the Alamo Irrigating & Manufacturing Company's ditch, and I irrigated this claim I spoke about from it. In the first three years of the existence of that ditch we had a very satisfactory service and I put out alfalfa. My land was not bottom land, that is, the land I irrigated was
5509 not bottom land. It was what might be termed upland. It was sloped, and there were two draws through it, and ridges, so that it had all the characteristics of upland, and I put in alfalfa and put about sixty acres in cultivation. I had gardens, trees and cane, all of which I irrigated. This ditch became involved in litigation and was somewhat abandoned. It was allowed to grow up with willows and become in a condition where it was of very little use down as far as my land lay. About three years ago a number of land owners under this ditch acquired the equity that the people of Massachusetts had and put the ditch in better shape.

Yes, I think I have had occasion during the last three or four years to notice the flow of water in the Arkansas river and the operation of this ditch I speak of. For the last two seasons they have irrigated land under that ditch, and this will make the third season that they have been irrigating under the new ditch. Yes, sir, I know what has been done during this time under this ditch;
5510 and as to the water supplying the ditch, the flow of water in the Arkansas river at or near Syracuse during the last three years has been very good, I would call it, for the Arkansas river. It was a greater flow during these years than during the years say from 1891 to 1894, at any rate, when the Alamo ditch was in operation. There has been more water in the Arkansas river at Syracuse in the last three years than there was at that time. Yes, I believe that there has been ample water flowing in the Arkansas river at the head of this Alamo ditch to supply that ditch during the irrigating season of the last three years or what is ordinarily termed the dry season, and in my judgment there has been a constant stream flowing in the channel of the river at that point during the last three years and during the dry season of the year. I will say there might have been short periods when I did not have a chance to observe the flow of the river that there might not have been ample water. (Objection.) Yes, sir, during the last three years there was ample water to fill this ditch for the purposes of irrigation, even during

the dry seasons. I have never measured the size of that
5511 ditch, but it is about twelve feet across and about three feet deep, and the grade where the ditch was of that size would average, I suppose, about two feet to the mile. This ditch prior to the last three years was out of order quite a considerable part of the time, yes, sir. By that I mean it was filled up, and these willows were growing in it. (Objection.) Yes, sir, later it was cleaned out and put in order, and it is in much better condition now than it was then. There was no dam except temporary dams thrown up with sand to force the water into this ditch. They never
5512 put in any permanent dam, no, sir. No, sir, I never knew of any permanent dams put in in that part of the country on the Arkansas. There was none in our county. No, sir, I have not heard any complaint there from those owning ditches during the last three years on account of the scarcity of water to supply these ditches. (Objection.) There has not been any complaint that I have heard, and I have talked with a great many men about the matter. I would say that there was perhaps four or five thousand acres of land cultivated under that ditch that was originally opened up and put into alfalfa; that is, that was irrigated at the time the ditch was built, originally.

Most generally it would be a failure in the matter of growing crops there without irrigation, as to anything except forage crops. Alfalfa and nothing of that nature could be grown successfully without irrigation. Irrigation is necessary for the raising of
5513 crops.

In my business as publisher of a newspapor of course I have occasion to ascertain the sentiment of the people in regard to matters that are of vital interest, and I know it to be a fact that the sentiment of the people up in Hamilton county is universally in favor of irrigation. (Objection and motion.)

On the uplands in many seasons cane, kaffir corn, broom corn and crops of that kind are raised fairly successfully. That
5514 is, perhaps not anything like as successfully as farther west, but what we consider fairly successfully. But in the valley on what is known as the second bottom land as distinguished from the natural hay lands of the low bottoms it is impossible to raise in an average season anything except a little cane.

Cross-examination.

By Mr. ASHBAUGH:

Yes, I came to Hamilton county in 1886, and at that time
5515 there was an impression that this would be a farming country and people could grow crops without irrigation. My impression is that they had a serious set-back during the next two or three years, and in 1887 and 1888 the people began to get out of there. I should say that the present population of Hamilton county is less than there was then in Hamilton county with the same boun-

dary lines. The present population is a little over 1,500. In 1890 the population was about 2,300 or 2,400. The land that I owned on the south side of the river I did not plow. It was grass land. I mowed it. It was a part of the natural hay land.

Kendall is about one-fourth of a mile back from the river. You can see the bank of the river from Kendall, but you cannot see the water unless it is exceptionally high. I moved onto my homestead in the spring of 1889 and broke up some of it in the summer
5517 of 1889 and put some in cane, but there was no irrigation there at that time. The first irrigation on my land was in the summer of 1890, and I think I irrigated about twenty acres. I sold that land about a year ago.

The Alamo ditch was constructed in the fall of 1889 and was completed down through my place in the spring or winter of 1889–1890. It was built by a corporation known as the Alamo
5518 Irrigating & Manufacturing Company, of which Mr. Overton was president. There were two ditches known as the Alamo—one as No. 1 and the other as No. 2. No. 1 is commonly known as the upper ditch. It was taken out of the river at a point about seven miles west of Syracuse and empties into the Lower Alamo at a point about a mile east of Syracuse; then the Lower Alamo is taken out of the river at a point about three and a half or four miles west of Syracuse and was built to a point about eight miles east of Syracuse and there it emptied back into the river through a waste-way, and afterwards it was extended on to Kendall, but the ex-
5519 tended part never was used to amount to anything. I think there were about six or seven thousand acres of land under that ditch. Yes, sir, the Alamo ditch was a very well built ditch for the size of it. As much of the land as was cultivated was irrigated fairly well from the ditch for a number of years. I do not think there was over four thousand acres cultivated at any time. The ditch afforded sufficient water to irrigate that land for a number of years. The ditch did not do very much good after about 1893 or 1894. A large number of the people who had been in the habit of taking water were dissatisfied with the service and refused to take water
5520 and that was due to the fact that the ditch no longer supplied the water. The service was unsatisfactory, and not getting the water, they didn't feel like paying rentals. A new company that has control of the ditch now and owns the ditch secured the ditch in the winter of 1902. The ditch from 1893 to 1902 was not entirely abandoned, you understand, but it was not carrying the amount of water that it did on the start, and not the amount of customers were being supplied with water. There was not a satisfactory supply of water in it. Yes, to a great extent it has been permitted to fill up and grow up with willows, but every year it carried some water during high water periods. During flood stages of the river—June, July or whenever the floods would come down the river. During the period from 1894 to 1902 I do not believe
5521 there was over a thousand acres taking water, and they were getting very unsatisfactory service on that. This land was

used practically only for alfalfa. They didn't try to raise vegetables, but raised cane and stuff like that and grew such crops as could be grown with one or two irrigations a year in high water. That was the condition when the ditch was purchased in 1902. I think the parties paid $5,000 for it, which was probably about half of the original cost of the ditch. This company was a local company of farmers. Alamo ditch No. 1 was bought by one syndicate of farmers, and No. 2 was bought by another syndicate of farmers, and they both put their ditches in shape to run water. Alamo No. 2 is now called
the Fort Aubrey. The upper ditch is owned by a company
5522 of farmers of which Mr. Pratt is the president, and is known
as the Pratt ditch. I think Mr. George Sellers is the superintendent of the Fort Aubrey ditch. They have their headquarters at Syracuse. The headgates of these two Alamo ditches are about five or six miles apart. They moved the headgate of the Upper Alamo ditch some little distance farther west, and I think the two headgates are about five or six miles apart. This was done to give them a better chance to get water. I don't know that I can state the exact time when this was done, but I think it was in the spring
or summer of 1903. There was no new land opened up that
5523 year, but I suppose there was somewhat in the neighborhood
of a thousand acres irrigated that year, and last year perhaps fifteen hundred acres. They grew principally alfalfa and crops that can be grown with one or two irrigations a year.

The supply of water in that ditch in 1903 was satisfactory for the amount of land that was being served. There was no one who took water from the ditch that year but had an ample supply for his land. There was perhaps a little short period, perhaps a week or two, that there wouldn't be enough water in the ditch to afford everyone all they wanted, but for alfalfa there was an abundance of
water in the ditch that year. I don't remember whether
5524 there was any water in the ditch after August, 1903. I have
no way of refreshing my memory whether there was any water in the ditch in September, 1903. I should say I saw that ditch during 1903 as much as two or three or four times a week. I couldn't say whether there was any water in that ditch in October, 1903. There was an ample supply of water in June, 1903. I think they turned the water in in March. They had an ample supply of water until, I think, along about the middle of April, and then perhaps for a week or so there was not so much water in the ditch, if any, but during May, June and July there was what we call a good head of water in the ditch most of the time. I should say fully half
of the time—more than half of the time. In August, Sep-
5524½ tember and October we begin to lose interest in irrigation.
We haven't the same interest in irrigation in August, September and October as we have in March, April, May and June, and our crops depend upon having the water in those months. Of course in August we commence to feel that the season is over, and especially in September and October, and that is the reason why I can't re-

member as to the condition of the water in the ditch during those months. We would use water in August if we could get it. For the last cutting of alfalfa water in August would be very acceptable, and, to the best of my recollection, there was water in August, because there was no complaint from those fellows. I would undertake to say that the water service during that season of 1903 was satisfactory. They had all the water they needed for alfalfa. The reason why the ground under that ditch is not being taken up more rapidly is that there is a scarcity of people up there to take hold of
that land and open it up. There is no question but what this
5525 year, with the example of last year and the season of 1903,
there could have been 500 or 1,000 acres of beets put in under that ditch if the people had been there to take hold of it and do the work. It was just simply a question of getting the labor performed. Yes, sir, it is true that for the last year there was more water in the Arkansas river and water during more months of the year than in
any previous year since 1886. I do not believe there was
5526 more water in the river in 1903 than there had been for many
years previous, but last year I believe there was more water passed down the Arkansas river than in any year since I have been here. Oh, no, I wouldn't undertake to say that the stage of the
river in 1886 was what it was last year during the whole
5527 season. We had floods in 1886 and in those years the same
as we have now. Last year there was an abnormal flow in the river and the biggest flood we had came down the river on the 29th and 30th of September and the 1st of October. The stage of the water in the river at Syracuse was nine feet. The first water turned into the ditch this year was some time during the week preceding yesterday. That was Sunday before last (this being May 1). I know that to be a fact because there was water running in the ditch at the time the rains came and flooded everything. There was plenty of water in the river before that time, and there was water in the river all winter and all last fall. The flow of the water in the river in the years from 1893 to 1900 was much less than the flow of water in the river last year. Last year, as I stated before, I think
was the highest water, and I believe the most water. I be-
5528 lieve the supply from 1893 to 1900 was less than in 1903. I
couldn't state positively that the flow of the river from 1893 down to 1900 was less than it was in 1896, but in 1893, 1894, 1895 and 1896—1896 especially—it was very precarious—there was very low water in the river. It was universally agreed there was less water in the river than there had been, and that began about the year 1892.

The Alamo ditch has been continuously operated since its con-
struction, to a certain extent, but between 1894 and last year
5529 not as much as it was the first three succeeding years of its
building. Yes, I should say that during the first three years after it was built it was practically operated to its full capacity. I cannot give the capacity in second-feet, but the ditch was twelve feet

wide on an average, and three feet deep, with a two-foot grade. When they began operating the ditch a year ago they didn't put in any permanent dam. During the first three years when it was operated it would supply about 5,000 acres. That is my judgment.

Redirect examination.

By Mr. GREGG:

5530 There is no question but what if this ditch had been cleaned out and there had been a dam in the river there could have been a great—several thousand acres of land irrigated from 1894 to 1902 (objection), and as a matter of fact if a temporary dam had been put in from time to time and the ditch had been put in good condition there were many years when most of the valley land could have been irrigated. Yes, every year there were floods
5531 came down the river that would have irrigated a great many acres of land—well, in fact all of the land under the ditch—if the ditch had been kept in order. Yes, I believe it is true that during many of the years between 1894 and 1902, during the irrigating season, there was sufficient water running in the river to have irrigated two or three thousand acres under this ditch if the ditch had been in proper shape to take the water.

In regard to the new company, when it began operating a few years ago, putting in a temporary dam by throwing up sand and putting in hay and stuff into the sand to conduct the water into this ditch, I know they went up there frequently during the low stages of the water and put in sand dams at the head of the ditch and also scooped out the sand bar in front of the headgate. Yes, sir, that is what they call a wing dam. They run it somewhat upstream to catch the flow when it comes down, and those dams are usually higher at the headgate than farther up the stream. If those
5532 dams had been in existence or if they had constructed those from time to time, there were many of those years during the irrigating season in which they could have used water in them to have irrigated two or three thousand acres or more, and one of the main reasons why there was not more irrigation during that time was because they were in litigation with this company and many of the people had left the country as a matter of fact, yes sir.

Recross-examination.

By Mr. ASHBAUGH:

I think that irrigation fell off because the people left, and the people left because the irrigation fell off. I think both causes had an effect on the irrigation in the valley. They quit using as much water after 1893 as they had been using before that because the service had proven unsatisfactory. In the years from 1893 down to 1902, during the summer season, of course there were floods in the river, high and low stages, and during these periodical stages

that came down the river they could have gotten water out, and the amount of water that they could have gotten would have been largely confined to that. Of course the stages of the river varied.
5533 They varied every hour. No, sir, I don't believe there was a sufficient flow of water at the normal stage when there was no floods or excess water so that they could have gotten sufficient water to irrigate from that canal the amount that they had before 1893, down to 1902.

Redirect examination.

By Mr. GREGG:

During the time from 1889 the people began to leave Hamilton county, and up until 1895 there was a decided emigration, not only from the valley but also from the uplands of that county, and this falling off in population was not confined to that part of the country only where irrigation was taking place, no, sir, but was gen-
5534 eral all over the western country. Oh, no, the falling off in population was not confined to that part of the country where they were irrigating; it was falling off in about the same proportion around in other parts of the county where they didn't pretend to irrigate. Yes, sir, that is true.

Recross examination.

By Mr. ASHBAUGH:

No, sir I wouldn't say that the people left the lands for which they could get a sufficient supply of water to irrigate between the years 1890 to 1894, but this was very largely confined to the parts where they did not get water for irrigation. I don't know of any place where irrigation was absolutely a success during that time in our county—absolutely a success. I should say there was a material falling off in Hamilton county between the years 1890 and 1894 from the lands that were irrigated from the Alamo canal. As to the proportion, I would not say positively as compared with other parts of the county where there was no irrigation, but there was a considerable falling off. They left that part of the county where the lands were irrigated because the service was not entirely
5535 satisfactory. The ditches seemed to do very well for two or three years and then they seemed to—well, they did—they failed. The patrons were not satisfied with the service. The ditches failed because of the lack of water and lack of keeping the ditches in repair, and a variety of reasons. The people seemed to lose interest. I believe it would have paid to keep the ditch in repair if there had been plenty of water in the river. The ditch company had troubles and they got into litigation and they neglected their ditch and didn't put money enough into the ditch to keep it in good shape. The failure of the normal supply of the water in the river

contributed, you understand, to this indifference on the part
5536 of the ditch management, and also to the indifference on the part of the patrons. There was a variety of causes. I would not assign any one reason for this condition that came about. But the failure or lack of water was one of the main reasons for this. Yes, the ditch fell into the hands of eastern people who had no comprehension of the conditions that existed out here and they seemed to be indifferent as to the matter of keeping the ditch in shape, and that litigation was one of the main causes as well as the unsatisfactory manner in which the ditch was run.

5536*a* DAN LARMOR, Garden City, Kansas.

Direct examination.

By Mr. HAYT:

I reside at Garden City, Kansas. I adjoin the town, just outside of the corporation, east, about three-quarters of a mile. I located in Kansas in the winter of 1884, and prior to that time I was in Colorado part of the time and New Mexico and old Mexico, and I was in Colorado three years. I went there in the spring of 1879 and left in the fall of 1882. I was located at Silver Cliff. Since 1884 I have lived within less than two miles of Garden City and have had occasion to notice the flow of the Arkansas river from 1884 down to the present time. During the years 1884 and 1885 for about three or four months in the summer the Arkansas river had full banks
5536*b* nearly all summer long. For the months of April and May and up to about the 10th of May there was not very much water. The rains during these months I have spoken of were very excessive. In July, in 1886, there was one or two of the largest floods I have ever seen here excepting one ten years ago this August. The spring of 1886 there was not very much water, and in the fall there was not very much water, but in the summer there was a good deal. A very large flood came in July.

I have had occasion to notice the flow of the water in the Arkansas river in the last two or three years, and it has been very good. Sometimes it has been full banks for two or three weeks at a time. The flow of water in the river for the last two or three years has not been so much as during the first three years—not as steady high water. I might say that there has been only about half as much as during the wet years I have spoken of when I first located here. It might not be quite that much, because the spring of 1884 or
5536*c* beginning of the summer, about the 10th of May, the river commenced to come up and it got full banks, and I don't suppose it ever ran down until October nearly—September anyway; then it got down so that a fellow could cross it nicely on horseback or even with a wagon about the first of September. I think the flow of the water during the last two years has been more than

during those years, outside of the years 1884 and 1885, on an average.

Yes, sir, I have bottom lands on my ranch, and the crops have been very good, the late years and the early years about the same. But if you will allow me to state, there were several years in between those years that bottom hay was very light. Hay is my principal crop. I do raise some sorghum and such crops as that. Yes, during the late years my crops have been as good as the average in the earlier years. Last year they were better than usual. The year before was not quite so good, but it has averaged very good.

Cross-examination.

By Mr. ASHBAUGH:

5536*d* The cause of the poor crops in these intermediate years was a shortage of water in the river. That lasted from 1886 to 1894, and until we had very high water in July, 1886, and I think after that, as near as I can recollect, there were several years that we didn't have as much water as usual. I know my hay crops were very light, for several years not much over half a crop. The hay crop is not irrigated. It sub-irrigates when the river comes up. Yes, the crop of those earlier years was dependent upon this sub-irrigation along the river valley. It depends all the time, almost, on that. Yes, the sub-irrigation was lower during these intermediate years than it was during 1884 and 1885, because we didn't have so much water in the river. It spreads underneath the ground. Yes, this sub-irrigation depends upon the water in the river. No, I would not say that the year 1904 was the wettest year for the last twenty years. Ten years ago this August there was more water went down the river, I guess, that year than any other year.

5536*e* If you will take the whole summer that year, we had a pretty good flow of water most of the summer, and it was about two or three times as much as usual during the month of August. It commenced about the 10th of August, I think, if I remember right. Yes, last year a flood came down here the very first of May, and then one a little later in May, and one in June, and then one that caused the Eden wreck in Colorado, and then another that caused the wash-out of the Santa Fe railroad up on the Purgatoire river. Yes, that kept up a constant and high flow of water during the year. There was a good flow, but still according to my information there was not as much as in some other years, but I may be mistaken. Yes, those floods during 1904 kept up the flow in the river, and that kept up the sub-irrigation under my land, and when that is kept up I have good crops on my bottom lands. When the flow of the river ceases the sub-irrigation under my land falls and my crops necessarily dry up. That is correct. About five

5536*f* years ago, I think on the 17th of March, the river got full of water and it stayed pretty full until June and then it took quite a while for the bottom to dry out so that I could do any plowing.

Redirect examination.

By Mr. HAYT:

No, sir, I have never had a failure of crops on my place, that is, for want of moisture. I had a failure of my sorghum one year, because I had too much moisture in the season and could not get it in early, but it was not for want of moisture. There are about 325 acres of first and second bottom lands in my farm. No, sir, I have never noticed any effect on the crops on the upland from this water that I speak of. I have about 150 acres of land on the north side of the river and 80 acres on the south side, and then I have two islands—there is one island of 100 acres and another of 25
5536*g* to 40 acres—along there. That is the first bottom. These islands I speak of are from one to two and a half feet above the level of the water in the river at the present time, I should judge; and at low water when it is nearly dry there is some of my bottom land, I think, that is six feet above the water that is on the river bank, and when you get back farther it slopes back to where it is probably not over two feet to water. Six feet is the highest, and the lowest about two feet. No, this land does not frequently overflow in times of high water, because the high land along the bank of the river protects that. If there is anything it is seepage water from underneath that will do that. Yes, the water has been over the islands in the river that I have spoken of since I have been here. There is one of them, consisting of about thirty acres, which it has not been over; the balance it has been all over ten years ago, in August, 1895. Yes, the water has overflowed a part of my land since 1895. On the south side of the river it overflows it once a year or maybe once in two years. There is on this island I speak of, this hundred acres, probably fifteen acres of made land,
5536*h* and then there is another island that I guess consists of about twenty acres of made land. The small island has not been surveyed. And when I speak of the low lands I include the lands embraced in these islands, and also this made land I have spoken of.

Recross-examination.

By Mr. ASHBAUGH:

I guess the underflow goes back under the uplands, and I will tell you why it makes me think so. How far back, I don't know. Now, I have seen it in less than twenty-four hours go from the river back 1,100 feet—the underflow—to the edge of my alfalfa. After that I couldn't tell. Yes, the underflow affects the bottom lands along the river, and it rises and falls with the condition of the river.
5536*i* I have observed that time and again. There can be no doubt about that, because my bottom is dry. I will keep watching back. I will keep watching at the back end to see how soon the water will get back there from underneath, and I know the balance of my crop is all right then. If the flow of water in the river is

good the underflow under my land is kept up and I get a good crop. If there is no water in the river we don't have any underflow. I remember one year was very dry. The 3rd day of July my bottom hay in places would be burned, right in the river bottom, because there was no water in the river and hadn't been that spring. That evening of the 3rd the river came up and got full banks, and in one week the grass was green and it looked as if it growed a foot in one week. It hadn't, probably, but it straightened up and seemed to grow that much. I have seen the underflow go back 1,100 feet in less than twenty-four hours to my knowledge, but it will not do that all over the bottom because it seems there are certain places it will go faster than in others, depending on what is underneath.

5536*j* Yes, the river is high at this present date, and was higher three days ago than it is now. I think it rose from what it had been two weeks ago—over three feet at the highest. This water comes from up the river somewhere. There were no local rains here. Local rains here don't have much effect on it. Yes, if the river could be kept up during the dry season and kept even it would have a good effect on my land. If I get about two high waters during the season that is all I care about particularly. That makes my crop. That makes two sub-irrigations and that saturates my land.

5537 BERRY W. NOLAN, Garden City, Kansas.

Direct examination.

By Mr. HAYT:

I reside at Garden City, Kansas, and have lived in what is known as Finney county now for twenty-five years. It was not Finney county then. I first saw the Arkansas river in 1880 while I was on my way from New Mexico to Kansas. I struck the river at Granada. Granada is on the Arkansas river; I couldn't tell just exactly where; it has been a long time. But that is where I struck the river coming across from Springer, New Mexico. I crossed the river there. That is commonly spoken of as Old Granada, and it is located, I think, within the State of Colorado, near the State

5538 line between Kansas and Colorado. I left New Mexico that year on the 12th of July and was fifteen days coming to Cimarron. It was some time during that time. I don't know exactly the date, but it was between the 12th of July and fifteen days later that I got to Cimarron. When I came to the river in July of that year there was very little water running down. We crossed on the bridge, but there was little water running down the river at that place. Then I travelled from Granada to Cimarron. Cimarron is about thirty-five miles east of Garden City, and I made the trip by team and wagon. Yes, we followed the river road and were right on the river most of the time. We never was out of sight of it, I think, and we camped at night on the river bank.

As we came down the river sometimes we would find water and at other times we would have to dig down in the sand to get it. I know one or two times we had to dig down to get water, and
5539 at other times there were little streams of water running along. There were times on that trip, yes, sir, when we had to dig to get sufficient water for our stock for camping purposes. Well, I don't think there was water at those places or we wouldn't have to dig for it. If there was we didn't see it. I remember distinctly digging wells in the sand to get water, and I am satisfied there was no water there or we would not have done that. At other points there was a little stream of water running here and there, winding around through the sand. Oh, yes, we could cross it on foot. I think I could have crossed it anywhere without getting my feet wet, jumping from one place to another. I had no occasion to cross the river, but I think I could have done so.

After 1880 I located on Pawnee creek, twenty-five miles north of Cimarron, in what was known at that time as Buffalo county. Pawnee creek, where I located, is about twenty-five miles from the Arkansas river. I was engaged in the stock business during
5540 my residence there, and I lived there about twenty-two years and moved from there to Garden City. Yes, I cultivated some land on Pawnee creek while I was there. Every year up to along about 1885 and 1886 we put in some cane for the stock, and after that I put in some alfalfa on the bottom and we couldn't raise any more cane, and I never raised any more cane, I think, after 1886. The reason we couldn't raise it was that the local showers seemed to have changed their course and instead of going down the Pawnee they went down between the Arkansas river and the Pawnee. The people out there raised cane in patches. No, sir, there was not sufficient water for the growing of cane there after 1886; not where I lived. I had good success in growing alfalfa. I grew it by irrigation. We had plenty of water the whole time I was there to irrigate with; that is, it was just a small stream of water. I had
5541 it dammed up and had water enough to irrigate twenty-five acres every year. I didn't try to irrigate any more.

In regard to the flow of the water in Pawnee creek during those different years, I would say that up along about 1885 or 1886, somewhere around there, there was less water in the Pawnee the year round. There may have been some dry times in the summer that it didn't run. I don't recollect but what it did, but after that time it stopped running and finally went dry entirely, that is, from my place this way up towards the head. I didn't live right on the Pawnee; I lived on a little stream that ran in below the Pawnee, fed by a spring, within a mile of the Pawnee. No, sir, I didn't irrigate this alfalfa from the Pawnee creek itself. No, sir, the water in the Pawnee up to 1885 or 1886 was not used for irrigation, not a drop, and there has never been since that I know anything about. There never has been any water taken out of the Pawnee to irrigate with that I know anything about.

Yes sir, I noticed that the lack of water after 1886 affected the grass in the same manner as other crops. The grass was
5542 simply dried up. And there were other effects, yes, sir. There is not as much blue-stem as there was at that time. Now, there is not as much blue-stem in that country as there was in 1880, and I think this was caused on account of the lack of water. The buffalo grass is a dry grass and blue-stem needs more water. I don't see any material difference between the conditions there and in the vicinity of Garden City. Of course I say where I lived it was hilly and we had different kinds of grasses there. Up on the flats it was only buffalo grass and ordinarily in the bottom it was blue-stem and salt grass, but outside of the rolling character of the country of which I have spoken the general conditions were similar all over the country so far as I know.

Well, I haven't paid any particular attention to the flow of the river for the last two or three years. Of course I have noticed the river occasionally, but am not interested in it and pay no particular attention to it because I don't depend upon the river for
5543 water. Yes, I have crossed it frequently, and I say that there is more water in the river this year and there was more last year than in the earlier years when I was in this vicinity. I think three years ago the river was perfectly dry. There was not a drop of water in it here at all where the bridge crossed; and that was three years ago. I know it was one year since I have been here, and my recollection is that it was at that time. I have crossed on the bridge and there was not a particle of water. I don't think it has been plumb dry since that time. There has been plenty of water. That is my recollection. I know last year they had plenty of water in the ditches around here all the time.

Cross-examination.

By Mr. ASHBAUGH:

I think in the fall of the year 1903 there was no water in the river here. I wouldn't be positive of the dates, but it has been some time during the three years I have been here that it was dry. Yes, there has been water in the river all this spring (1905). I think there was water in the river all last year, but before that time
5544 the river was dry for a number of months in succession. I couldn't say how long. I know one particular time I crossed the river when there was no water in it. I haven't been across the bridge here at Garden City a great many times, just once in a while. I have no business over there more than just looking around.

Examining Complainant's Exhibit A–45, I will say that looks to me very much like the bridge across the river here at Garden City. I should think it showed the condition of the river during the dry spell that I spoke of in 1903. I don't see any water there in the picture, and I didn't see any then in the river.

Pawnee creek empties into the Arkansas river just west of
5545 Larned. I didn't know anything about the Arkansas river here particularly until I came here. Of course I did my trading at Cimarron, but I paid no attention to the river. I know the Pawnee has been dry a great many times in the last fifteen years—perfectly dry—but the Arkansas river, I have heard of it being dry but paid no attention, because I wasn't interested in it.

Pawnee creek rises about eighteen miles north and east of Garden City; that is, the headwaters of one of the prongs; and then there is another one that comes in from the north, which would make it a little farther. The waters in the South fork of the Pawnee come out of some springs about eighteen miles north and east of here—about twelve miles north and the balance of it east. I couldn't say how far these springs are from the Arkansas river. On this road I go by I ride by the head of the Pawnee in going back and forth to my place, down where I used to live, but how far it would be straight across I don't know. I think the river
5546 runs pretty nearly east here. I couldn't say whether these springs are higher or lower than the bed of the Arkansas river. I should say that the Pawnee creek is lower throughout its course than the Arkansas river. I don't know, though. I don't know whether that is a generally known fact, but I think from the lay of the country and everything that it is lower than the Arkansas river.

Redirect examination.

By Mr. HAYT:

Why, there is a kind of a rolling ridge between the Arkansas river and the Pawnee creek, yes, sir. It is a kind of rolling ground. I don't know about the ridge. There seems to me—coming to think—that there is a divide; that is, it divides the water. A person would hardly notice it; I never would; but I know about half way between the draws run to the Pawnee—that is, down where I live the draws run that way—and when you get over it runs into the Buckner. I don't know where the Buckner empties; it runs parallel with the Arkansas river, and these other draws seem to run to the Pawnee. I think I have heard them talk about the South branch and the North branch of the Pawnee. Yes, there was a little town near where I lived, called Ravana.

Recross-examination.

By Mr. ASHBAUGH:

5547 The Pawnee river runs in a general course from west to east and about parallel with the Arkansas river. I should say that the South *or* Middle forks of the Pawnee didn't rise less than

ten or twelve or fifteen miles from the Arkansas river. I
5548 never was across there at the head. I don't know anything about the topography of the country particularly, only I think it is lower along the Pawnee than along the Arkansas, but I don't know, because I never measured it. There are no springs that I know of on the Pawnee only right at the head of it. The Pawnee is formed by springs.

5550 D. E. HOGBIN, Garden City, Kansas.

Direct examination.

By Mr. GREGG:

I am sixty-five years of age, and live at Syracuse, Kansas. Syracuse is about the center of Hamilton county, east and west. I have been county surveyor and city clerk, and have also done farming. I have lived in Syracuse and that vicinity since 1890 and prior to that time I lived at Kendall. That is a town on the Arkansas river near Syracuse. I lived there about seven years. Yes, I came to that part of Kansas in 1883.

5551 I engineered the construction of the Alamo ditch, or was engineer on the construction, or superintendent, or whatever you might call it. Yes, sir, I surveyed for that ditch and had charge of it. I have made some study of the matter of the flow of the water in the Arkansas river in Kansas. I have observed it somewhat, and have irrigated land in that vicinity from that river. Yes, sir, when I was living at Kendall I had opportunities to see the flow of the Arkansas river at that point. I have been living at Syracuse, Kansas, during the last three years, and have observed somewhat the flow of the river there during that time. The flow of the river during the last three years has increased as compared with the years preceding, and I should think that the steadiness of the flow during the irrigating season during these last three years has been
5552 more uniform. I don't think there have been periods of scarcity of water for so long a duration.

The Alamo No. 2 ditch, from its head to east of Syracuse, was built twenty feet wide at one time, and the balance of the way east it was twelve feet wide. The upper ditch or ditch No. 1 was built on an average of about eight feet wide and varied in depth from two and a half to three feet; the Lower Alamo ditch, on an average, was about the same—from two and a half to three feet deep and four or five feet in some places.

Yes, sir, there has been enough water in the Arkansas river during the irrigating season of the last three years to supply that lower ditch with water for irrigation, and the flow of the river at the headgate has been ample to supply it for that purpose. Yes, sir, I think the flow of the river during the last three years has been steadier and more uniform during the irrigating season than in the years

preceding. Yes, I think there has been an increase in the
5553 flow during the irrigating season for three or four years, and there has been ample water flowing during that time to supply that ditch for irrigation. Well, during the time preceding the last three years the condition of this ditch was not quite as good, perhaps, as it is now, but it was in a fairly good condition so far as running water is concerned and the capacity or size of the ditch. It has to be worked more or less every year anyway, and if you don't it will practically fill up. It depends on how the ditch is used, the amount of water that does run or can run in it.

Yes, sir, from 1889 when the ditch was constructed up to 1893 or 1894 there was considerable water used through that ditch for irrigation, and after that time I think there was about as much used, perhaps until along in 1897, pretty nearly as much as during those former years, yes, sir, but of course during 1896 and 1897 there was a shortage of water, that is, at longer intervals than usual; but during the flood times, late in the fall and early in the spring,
5554 there was always water. As to the reason for the ditch being used less after 1895 or 1896, I would say it was permitted to run down and was not looked after properly. At times if there had been a wing dam in the river sufficient water could be obtained for the full irrigation of the land under that ditch (objection), and at times there could have been without any dam. When the river got low enough so that we could dam off the stream, we did put in a sand dam and get a good flow in the ditch that way; otherwise, we wouldn't get but very little. Our headgate was built twenty-four feet wide, but the ditch had narrowed up to something like twelve feet, and it meant that our headgate proper was really not over the width of the ditch. Yes, sir, it had filled up from time to time. You could better the condition of the ditch in the way of cleaning it out in two or three weeks with a few teams. The ditch has
5555 never been put back to its first capacity. The head was built twenty feet wide for perhaps five miles, and it filled up by neglect—by the accumulation not being taken out every year—until it wouldn't average perhaps on a grade over twelve feet wide.

Yes, sir, I made surveys for ditches along what is called Bridge creek and East Bridge creek, just east of the State line, and those creeks ran water at the time of the survey. Yes, sir, there were some times in the years prior to that that these creeks were dry, and that condition had existed for a long time. They were what are known as dry streams, running only in times of freshets. I think I made the surveys for those ditches about 1895, and for some of them later, and perhaps some of them in 1894.

5556 As to accounting for the fact that those creeks where I made the surveys for ditches had been at all times prior to that dry, and at the time and just before I made the surveys there was running water, I would say (objection), that I think during 1893 or 1894—I don't know just what time it was—a ditch company that was known as the Amity Company built a ditch into Kansas

out of Colorado and ran water into Kansas as far as Plum creek—Plum creek is about three miles west of Syracuse—and across West Bridge and East Bridge and some of the prongs of those creeks, where they put in large dams across the creek and the dam made a reservoir of the creek proper and the creek was part of the ditch at that time and part of the reservoir and the seepage from the Amity ditch from this dam and on each side of the creek where the ditch ran up and down the creek after it crossed it would come out and make up a stream in the creek. That is how I account for that. Yes, sir, the Amity ditch afterwards ceased running water down below the State line. There was no water after that. And the

5557 effect upon these creeks was that they went dry just the same as they were before. As to the increase in the flow of the Arkansas river at or near Syracuse during the last three years, I will say that I don't suppose I could account for it. I might have a theory; that is, I think it is largely made up by seepage of the water back into the river that is used for irrigation. (Objection.) Not only the ditch itself, but from the land irrigated farther up the Arkansas river; and sometimes this seeped water does not show or flow clean to the river. After it passes the last strata, where the creek cuts the strata in two, there is nothing to bring the water out any more. It seeps into the sheet sand and doesn't show, but there is no question but that gets to the river in the regular way by seepage, but it may be largely from other natural causes—more rain or more snow west of us. I have observed that we have series or cycles of time here when we have a greater amount of rain and a greater amount of water in the river than at other periods, but we are liable to find a low stage of water at any time in any year. Well,

5558 taking those cycles I speak of and comparing them in the years preceding 1886 and 1887 and along there with the last three years, I should say it compares favorably, I think. As to the average flow of the Arkansas river at or near Syracuse between those former years, say from 1883 to 1887 and the last three years, I should say the amount of water in the aggregate I don't think would be very much different during the whole year, and as to the lengths of the dry periods, I would say that as to the time and duration I could hardly say, but from 1879 to 1883 I was frequently up and down on the Santa Fe railroad. I was employed on the railroad at that time, and during those years, as near as I can recollect, every year there was some period that the river was dry, as dry as it has ever been since; so that in taking cycles of from three to five years since 1879 and up to the present time I don't think there is very much difference between now and then. And this is true as well as to the irrigating season or dry season as to other times of the year.

5559 I came to Kansas in 1868 and stopped for a time at Lawrence, Kansas, and in November of that year I commenced to work for the Santa Fe Railroad Company. I was a mechanic, employed on the Kaw River bridge, and afterwards was superintend-

ent of bridges and buildings, and while so employed I lived at different places. I lived at Topeka, Ellinwood, Sterling, Nickerson, and I came up the Arkansas river in that capacity in June, 1872. That was at Hutchinson, Kansas. Yes, sir, my duties took me up along the river during that time and in subsequent years, up and down at intervals, until I quit the road in 1883. And of course I could see the river from the train when the train struck the river close, and when I would happen to be down on the bank of the river during that time, but it was not part of my business then and I didn't take any special note of the river so as to keep it

5560 in mind. Yes, I was frequently in Dodge City, Sterling, Ellinwood and those places, and I noticed the river more particularly at Dodge City along between 1879 and 1883, and as to noticing it during the dry season of the year, it was dry there anyway. I know that very particularly, and that time was along about the first part of the '80's, I think. Maybe it was 1881 or 1882. Yes, sir, at points during those years I saw the Arkansas river absolutely dry, without a current flowing in it. And those points were at Dodge City and along by Ellinwood and down in there. It seemed to be a drier stretch down there than it was in some places west. Well, I have noticed it practically dry every year. At some time during the year it would be what we would call practically dry. There wouldn't be much water in it. I noticed it particularly in April, 1883. It was dry then so that you could step over it.

5561 That was east of Kendall and along there. Yes, in those early years I noticed that a number of times the river went entirely dry along at those points. There were stretches where the water didn't flow. That is what I mean by "dry;" and in other portions there would be just a little stream running. And as to comparing the flow of the stream during those earlier years with what it has been during the last few years or a number of years back, I should say I don't think there is very much difference. I should think, taking these cycles of time, that the river is about the same. But there was a time along about 1896 and from that for several years that there was several years it was rather extraordinarily dry; that is, the low stages of the river were of longer intervals and there has been but few years since my experience in running that ditch—I don't know as there have been any years—but what there was a shortage during these low times at some particular time. But then the people didn't suffer very much on account of that because the times were of short duration. Along in 1896 and along there the low water stage was at longer intervals than it was before. Yes, sir, I think the year 1896 was one of the driest years we ever had—somewhere along about that time.

Cross-examination.

By Mr. ASHBAUGH:

5562 As to there being more flow of water in the last three years than there was in the years before, I will say there has prob-

ably not been any more, but during the irrigation season it may have been more uniform. The river to-day is not so very high. It has been high, but it has gone down a whole lot. There is a good flow of water in the river now and has been for a week or two. We have had two rises in the river, one, I think, about Thursday.

5563 I don't think that seepage from the Amity ditch caused all of that. I think it may have caused some of it. I expect the last rise in the river, or most of it, was caused by the excessive rains in Colorado. I think there have been very excessive rains and excessive snows that melted there. In some part of the year 1904 I think the river was high—very high; that is, most of the year. This was caused by excessive rains coming over a large territory all at one time. I don't know where these rains were, but anyhow there were two or three floods came down the river. I think one of those floods caused the Eden wreck where there was a severe railroad accident; another one might have been up at Trinidad that

5564 washed out the Santa Fe track. But I don't know where those floods came from. There were floods in the year 1903, during some part of the year. I couldn't say whether there was any rise in the Arkansas river in the months of August, September, October or November in the year 1903. There probably wasn't. There was some water in June and July, 1903. After July there might not have been any water in the river through Hamilton county. I don't know. We have had an increase, I think, in the aggregate at least during the year 1904, and during the last two years, and I think it has been on the in-

5565 crease for longer than that. I irrigated in the latter part of November, 1903, but I think prior to that time for quite a time there wasn't very much water in the river. That is my recollection. The banks of the river at Syracuse have widened during my residence in Hamilton county. I don't know how wide the banks of the river are in Hamilton county according to the Government survey. The banks of the river through Hamilton county are meandered. The banks at Syracuse where the bridge is are nearly twice as wide as they were twelve years ago. The river is

5566 about 900 feet there, something like that, now. I think the river there is fifty or one hundred feet in width more than 780 feet wide now, and 800 feet wide would be a fair average through Hamilton county. It is wider than that in some places and not quite so wide in others. If the Government survey shows the river at Syracuse to be 1,172 feet wide when the survey was made, no, it is not twice as wide now as it was then; but

5567 when that bridge was built there first in 1885 or 1886 there was an island just above it. There were two channels on each side, of about the same volume, and the current came down and converged and piled up, and it throwed all the water together in the center in one current, and that made a narrow place at this point, and they selected that point because it was a short distance across the river. I didn't mean to say that the banks of the river

now are twice as wide as they used to be twenty years ago through Hamilton county. I meant at this particular case at Syra-
5568 cuse. I think the banks are as wide through Hamilton county as they used to be twenty years ago, on an average. I think on an average they would be about the same; when the flood water comes I don't think there is any practical difference.

I am not acquainted with the width of the river through Kearny or Finney counties. At the time I saw the river dry at Dodge City in 1881 I don't know what month it was but it was during the dry season and in the summer time. Oh, yes, I have seen the river down along by Dodge when it had water in it. I have often seen
5569 water in the river at Dodge. When I saw it that there was not water in the river at Dodge in those years, I think that was an exceptionally dry time. Yes, sir, the fact is that during the dry time of the year you would find the river dry at Dodge.

5570 The Alamo ditch ran down after 1895. This was caused by the people—the owners of the ditch and the people who were depending on the water. They ought to be interested in getting as much water as they could. As to what caused it to run down, I will say that in 1888 Mr. Overton organized the ditch company, and he got another party by the name of Mr. Lord to first put some money in it, and in 1889 the ditches were constructed. There
5571 was $100,000 of bonds issued on the ditch, and George B. Lord was made receiver, and all together during that time there was about $10,000 went into the construction of the ditch. They bought Mr. Overton's stock and paid him in notes, and reorganized, and did some work on the ditch, but no money was expended, and they got pretty good service themselves, but they never paid for the water that they got. There was no money to go ahead, and finally they left their ditch worse off than it was, and in 1897 the bond holders foreclosed and it went into the hands of trustees and they undertook to operate it, and if it had had the support of the patrons they would have made a good ditch and made some money out of it, but by this time the people had been educated up that they would contract for water and not pay for it without litigation, standing in with one another against the company, and the result
5572 was that the company didn't have any revenue to do anything with the ditch. Yes, in 1894, 1895, 1896 and 1897 they got some water from the ditch, and some of them a whole lot more than they contracted for, but during those years I don't think they irrigated more land than they did before that time. There were not as many who contracted for water. I don't know why they didn't contract for it. No, I will not say that in 1894, 1895, 1896 and 1897 there was water enough in the Alamo ditch to supply the demands under the ditch. I will say this—that the ditch didn't run the water during all of the irrigating season sufficient to satisfy the needs, perhaps. Sometimes there was a shortage. There was a shortage, perhaps, sometimes in the ditch, when it was not in the

river. This shortage commenced along about 1896 and lasted for two or three years. Yes, I think there was less water in the
5573 river in about 1896 than there had been at the time the ditch was dug. It was not because of people not paying for the water that they didn't get a supply at the time they needed it. Some of the patrons of the ditch that got the most water paid the least. I know that to be a fact. I was one of those that were attending to the ditch and trying to get those fellows to pay that wouldn't.

During the years 1894, 1895, 1896 and 1897, taking the whole year through, I don't think there was as much water in the river during the irrigating and the dry season as during the three years that the ditch had operated. This loss of water contributed
5574 somewhat to the dissatisfaction of the water users. Yes, there was a great deal of dissatisfaction on the part of water users because they didn't get a sufficient amount of water. That is always the case so far as that is concerned. There has been a kick every year on the part of the consumers. It depends on the individual, not on the supply. There was a whole lot of the time there was water in the river when it wasn't in the ditch, and there were intervals when there wasn't any in the river. This was not the only cause of the dissatisfaction of the water users, but it was one
5575 of the causes, perhaps. The headgate was built twenty-four feet wide, and if we took a foot of water that is about all we ever took in.

I don't know how long they ran water down into Kansas through the Amity ditch. Two or three years perhaps. The water I spoke of in those creeks was from seepage. They did empty their waste water into Plum creek.

5576*a* B. F. STOCKS, Garden City, Kansas.

Direct examination.

By Mr. HAYT:

I am a lawyer, and am engaged in the real estate business also, and live at Garden City, Kansas. I have been a member of a real estate firm ever since I have been here, twenty years. I located here in 1885. Yes, I engaged actively in the real estate business in the earlier years in this way—I was engaged actively in the practice of law, and have always had a partner with me, and have been a member of a firm that handled real estate in connection. We have handled real estate ever since I have been here. In a way, I have been interested in farming in Finney county during the time I have resided here. I have owned but one or two different farms and farmed by proxy and by overseeing, practically every year
5576*b* since I have been here. I haven't owned a farm in Finney county for a year, but I owned one continuously up to 1903

and sold it and bought another and owned that a year and sold that. The first of these farms was located about three miles north of Garden City, and the latter one about four miles northwest of Garden City, both under what is called the Farmers ditch. During the years I owned these farms part of the seasons I had the ground leased and part of the seasons I had the land farmed by employing men to operate it—to do the work. It was cultivated largely to alfalfa. There were some other crops. And during these years I kept in close touch with the farming operations and saw the farms frequently. These farms were under ditch, and it was my intention to rely upon irrigation for the growing of crops, yes sir. I
5576c think irrigation has a tendency to diversify the crops—to increase the variety that can be raised. Wheat, ordinarily barley, and some of the varieties of sorghum for cattle feed, and millet to some extent, can be raised successfully without irrigation, and alfalfa, oats and the other small grains—wheat, rye and barley—can be raised much more successfully by irrigation then without. Irrigation is essential to the growing of trees and the raising of fruit, etc. Oh, there has been fruit produced here without irrigation, but the orchards are of very little productiveness and very short-lived. I have known a few orchards outside of irrigation, especially peach orchards, that would be productive probably four or five or six years, but they were very short-lived.

Lands outside of irrigation I should say range in value from $3 to $5 an acre, or possibly a little above that where there are better improvements, while lands under irrigation will range from $20 to $75 an acre, of course depending on the fact of improvement
5576d or the value of the improvements.

As to the productiveness of lands under irrigation as compared with those without irrigation, I would say that in some crops there is hardly a comparison can be made. Alfalfa can be raised only under irrigation, and while some grains can be raised in certain seasons outside of irrigation, yet it depends on the matter of rainfall, while where there is a sufficient amount of water to give the crops from one to three irrigations a year crops are sure under irrigation.

As to the value of lands at the present time compared with their value in previous years, I should say it is from fifty to two hundred per cent. higher now than the values have been back to 1888. Prior to that during a couple of years known as the boom years values fluctuated practically up to what they are now, and in some instances above, and in my judgment there are two main causes for this increase in value—one is that population is pushing into the western part of the State and making a demand and actually taking up and cultivating the lands, while a leading feature for the advance on the bench lands under the ditches, and the bottom lands, is the fact of the development of our irrigation systems in the last three or four years. This has had much to do with the value of lands—the development of the irrigation systems.

5576e Yes, it is true that the people that have been here for a number of years, old settlers, outside of irrigation have become more accustomed to the country and understand it better and are more successful in raising crops. Of course they now outside of irrigation practically handle land with the raising of cattle, largely, and sheep, as the basis, and not so much for the production of grains to be shipped to market. In the early years the first lands were were limited to the production of grains put on the market—now our farmers outside of the ditches cultivate their lands with the idea of producing feed for stock and such grains as they need for feed rather than producing grain alone for the markets. I should say from my experience as a farmer and real estate owner that we feel that the future prospects of this country are very bright just at this time, and I base that conclusion partially on the fact of a better understanding of the country, the absence of hot winds that bothered us in former years by reason of bringing more land under cultivation, and the development of our irrigation systems and ditches.

5576f I was one of the organizers and a charter member in the organization of what is known as the Farmers ditch—the Finney County Irrigation Association is the title of it—organized about four years ago, and I was secretary of that company for two years and owned stock in it and water rights and land under it until year ago when I sold my interests. I am an owner in the Garden ty Irrigation Association—the Garden City ditch—and am now cretary and have been for three years of that ditch company. I was acquainted with these ditches prior to the time I have just mentioned. I have been familiar with them ever since I have been here—twenty years. I first became interested in them in about 1887 when I bought this tract of land I speak of, and the ditches were in fairly good condition at that time and supplied water for irrigation. I had no trouble in getting water for my land

5576g then, and it continued in a measure that way for three or four years; then the ditches I should say about 1890 to 1892 became in bad repair—that is, they were getting into bad repair. About that time they went into the hands of receivers by reason of failures of the ditch companies, and from that on until four years ago the ditches became more and more filled up with sediment and less useful, until it reached a stage at which they were practically of no benefit whatever, and there were one or two years at last in which I think they were not used at all because of the fact that they were not in condition to use. Well, during those years that they were not in use they were filled up by reason of deposits of sediment coming from the former flows of the water from the river. When the ditch was bought by the farmers four years ago I was one of the committee that made the inspection of it. We found many places of a ditch that was chartered as a twenty foot ditch that we could step across, that is, as to the channel through which the water ran. There were places that probably would not begin to convey ten

cubic feet of water, and that was very common, through the main part of the ditch. The laterals were all filled up and many of them were so that they were totally useless. After that ditch was
5576*h* cleaned out and put in good repair it would convey something over sixty feet. That is, I mean measuring say 20 feet wide by 3 feet deep—and I am speaking of feet in area of a transverse section. I don't know technically as to the cubic feet per second, but a channel 20 feet wide and 3 feet in depth. We don't measure the flow here by cubic feet per second; we measure it by an orifice, and we call it so many feet. I should say that after the ditch was cleaned out it would easily carry eight to ten times the quantity it would before it was cleaned out. Since these ditches have been put in repair we haven't always had sufficient water for the purpose of irrigating the lands under them, but generally speaking the last two years we have had. But then I would say that three years ago there could not be said to be a good supply, as much as was entirely wanted; that is, during the year 1902, the first year under the present management. In 1902 the ditch was new.
5576*i* The construction of it and cleaning it out was practically equivalent to a construction or the making of a new ditch. The sides and bottom were porous as they had been cleaned out and the banks were loose and we had the first year a great deal of trouble with the breaking through of the banks, until they became solid. I suppose that was probably one reason we failed to deliver water to the lands when we would apparently have a good head of water in the ditch. Yes, oftentimes during that first year when we had a good head of water in the ditch we failed to deliver water to the lands for the reason I have stated. I have seen it where there would be apparently almost a full ditch and in a distance of six or eight miles the water would almost totally disappear. That was practically for the first two or three months in which we were operating the ditch. Yes, sir, this washing away of the banks I spoke of occurred several times during those two or three months so that we had to constantly keep men on guard to provide against it.

Yes, in 1903 and 1904 I don't know of any complaints of not getting a supply of water, and during the present year up to the present time there has been an abundance of water in the river.
5576*j* But there has been no water used by the ditch this season (1905) yet, because the people—the patrons of the ditch—didn't call for it—didn't need it—on account of the large rainfall we have had during the winter and spring. At any rate there has been an abundance of water in the river but they haven't been using it and the ditch is in condition that it can be used if they need it. Yes, sir, there is an abundance of water in the river at the present time, and we had a heavy fall of rain here early in April. In the first week of April we had something over an inch of rainfall at one time. We had one or two other lighter rainfalls in the early part of the month, and we had our last heavy rainfall a week ago yesterday. It was on the 22nd and 23rd of April. From this last.

rainfall there was a rise of about seven or eight inches in the river immediately following. This rain lasted Saturday night
5576*k* and all day Sunday, and Monday there was a rise of about seven or eight inches of water in the river. I should say that possibly there was not much difference between the flow of water in the river during 1885 and 1886 and the water in the river during the last two or three years. There was a good flow of water at that time during 1885 and 1886.

I have kept a record of the rainfall for about nine or ten years back, and I did so at the request of the Weather Bureau, emanating from Topeka. I am the local observer—just a volunteer. It is voluntary but is kept under the authority of the Government of the United States, and I make weekly and monthly reports. My immediate superior is the United States officer of the Weather Bureau at Topeka. Yes, I can tell what my observations for these years show in a general way. I have the daily reports. I keep a
5576*l* copy. And I have that report with me. (Witness produces said report.) This report shows daily reports. I can give that if wanted. Then it shows a summary for each month, which can be given if desired. It also shows the totals for each year. Going back to 1897, the total precipitation for that year, which covered rain and melted snow, was 21.54 inches, for 1898 the total precipitation was 28.54 inches; for 1899, 20.98 inches; for 1900, 19.29 inches; for 1901, 18.29 inches; for 1902, 19.53 inches; for 1903, 20.54 inches; for 1904, 21.05 inches.

The people of this county depend upon the rainfall for the growing of crops here on lands not under the ditch, entirely. I don't think there is any material difference between the productiveness of the land in this county in late years as compared with the earlier ones. From my judgment and from my varied experience extending over a period of twenty years, I don't think
5576*m* that irrigation from the river in this county has materially affected the flow of the river below, and my reasons for thinking so are, in the first place, when there is a large head of water in the river the amount taken out by the ditches in Finney county—and so far as that is concerned in western Kansas—will not materially affect the amount of water in the river, because it would be so small a percentage of it. When there is a small supply of water in the river, say only sufficient to fill the ditches, I don't think the taking or not taking of that water would affect the flow of water in the river 150 miles down the river at all. In fact I have passed up and down the river on the train at different times when there would be a fairly good head of water in the river at this point (Garden City) and there would be absolutely no water perceptible in the river a distance of 100 or 150 miles east of here. So I think that the taking of the water from the river for the ditches when there is a full supply of water in the river would be so small a percentage that it could not affect the flow below, while when there is a small supply it will disappear, or, as is the common experience, will sink into

the sand, and will not affect the flow 100 to 150 miles east.
5576n I have seen that from observation. I could only make a rough estimate as to the amount of water these ditches will carry when they are running at their full capacity. Now, understand what I mean when I give the measurement. It would probably not exceed the water that would be carried in a ditch 100 feet in width by 3 feet in depth. That would be 300 feet of a transverse section of such a ditch. In other words, putting all of the western Kansas ditches as equivalent to about five ditches of 20 feet in width and 3 feet in depth, running at their full capacity. And usually the grade is about 1½ to 2 feet to the mile. The grade of the river is about 7 feet per mile, and we necessarily have to dissipate that grade by getting up onto the uplands. Our ditches, the Garden City ditch and the Farmers ditch, I know are made on a grade of approximately 2 feet to the mile. I think I am fairly familiar with the opinions of the citizens of this county on the question of irrigation, as I have heard the matter discussed in connection with this suit, and also disassociated with this suit (objection), and I would say that practically the unanimous opinion is that the water
5576o should be used for irrigation purposes and not permitted to pass off under the riparian principle; and coupled with that, the unanimous opinion is that Kansas should have its rights of priority in comparison with Colorado.

From my judgment as a lawyer, a strict enforcement of the doctrine of riparian rights and the exclusion of the use of water for irrigation purposes in western Kansas would simply make it the
5576p desert that it was twenty-five years ago, and the people who have settled here and have expended their money might as well move out. (Objection.)

I think that the values of land at the present time are on a more stable basis than they have been at any time in the past, and that is the result of the reasons I have given, and by reason of the development of our ditches.

The date of the last rainfall was the 22nd and 23rd of April, 1905. It commenced on Saturday night, the 22nd, if I am not mistaken, and the rain was over some time on Sunday night, the 23rd. There was a full twenty-four hours of rain, or possibly more. Yes, that rain may have extended into the 24th.

The big rise in the river of which I have spoken began on Monday and was about seven or eight inches, and about the Thursday following there was quite a considerable rise, perhaps two and a half
5576q feet of a head of water came down. This may have been on Wednesday. I would not be positive about that. But it certainly was not earlier than that. (The witness was here allowed to examine his office records.) It was on the 25th of April. Now, there were three rises last week—one was on Monday, of about eight inches, and a second, whatever day it was, Wednesday or Thursday, of something near three feet. Possibly Tuesday. And then on Friday night about eleven o'clock there was a rise of—well, on top it

had dropped to about three feet in the river and there was a rise then of over two feet at that time, lifting it to about five and a half feet, the highest there was during the week.

Cross-examination.

By Mr. SMITH:

During the year 1904 there was more water in the river on the average than there was for the last three or four years pre-
5576r ceding that. The rainfall for 1904 was just about normal. I think there were no unusual floods in 1897. Yes, these rises in the river that I spoke of came down the river in waves, and the high water comes from the west. Universally, it comes from up the river. My judgment is that in many instances a large body of it comes from Colorado, but I am satisfied that the rise of about seven or eight inches as stated, last Monday, was more from local rainfalls, because the Colorado rise came a day or so later.

There are no distinct streams, except some small draws, or any tributaries, to the Arkansas river in this county. There are places where at the banks of the river the ground is higher than it is farther back; but that is not true on the average; and there are other places it is practically level back for a distance. There is
5576s very little surface drainage along this valley in Finney county into the Arkansas river. This rise of seven or eight inches that I spoke of came from above. I should judge it came from Kearny county, and possibly from Hamilton county. There is much greater drainage from those counties into the river than from Finney county. Yes, from my observation it is true that the floods in the river come from above. I think the bulk of the flow of the water here in Finney county comes from Colorado, yes sir. After you leave the Purgatoire in Colorado there are no streams or any considerable tributary to the Arkansas river until you
5576t get to Garfield, in Pawnee county. There are a number of draws that draw the water from slopes that are what are marked on the maps as streams but in fact are only wet water draws. They only run where there is an excessive rainfall. I think as a rule a local rainfall does not have a great effect on the river. Certainly not in Finney county, and perhaps not to a great extent in the State west of here.

Yes, sir, we want all the water that belongs to us or that we are entitled to, and assuming that the ditches down here have a priority over the larger ditches in Colorado, I do not think that we are getting the full supply for these ditches here. Since the Farmers' ditch has been constructed it has been getting its full supply of
5576u water during the last two years, but prior to that it did not. It had not been getting its full supply before that since 1890. Back in those early years it usually did, but not after that. During those early years from 1880 to 1887 at times we had all that our ditches—the trouble was more in the ditches being out of repair, and

at times a full head of water would pass down the river when the ditches were in no condition to take it. As to the time when this full supply of water for the ditches first ceased, well, the farms began to lack in the quantity furnished by the ditches in about 1890 or 1891. The real fact of the business is that the owners of the ditches were foreign corporations. They wouldn't spend a penny toward the repair or improvement of the ditches. They insisted upon iron-clad water contracts, and in many instances recovered
5576*v* upon those without furnishing a drop of water. The farmers simply refused to further support the ditches or make further contracts unless they furnished the water. The ditches went into the hands of receivers. There were no means for cleaning out and repairing the ditches, and as a result there were five or six years in which the ditches were almost out of use, until they went through the Federal courts and passed into the hands of the Farmers' Company, where they now are.

No, I don't mean to be understood as saying that through all those years there would have been a full supply for those ditches if they had been cleaned out. I think there were years when there was not a full supply. It would be difficult for me to state what years there were when there was not a full supply if the ditches had been cleaned out, from the fact that I didn't keep any record of it. There was one year that I recall, about between 1893 and 1896 would be my best judgment, in which there was absolutely no water passed down the river during the spring and summer and fall, and there were other years when there was a scarcity of water.
5576*w* From 1890 down to 1900, generally speaking, taking the average of the months from May to the first of August, there would be a flood which would cover a period of six or eight weeks, and there used to be from two to three months in which there was an abundance of water passing down the river; but at other times, and usually in the fall months, there would be a shortage of water, say from October to December, and probably February, March and April. As a rule we have a good flow in August and sometimes in September. We had one of the biggest floods we have had in years last September, 1904.

No, I don't wish to go on record as saying that these ditches had an ample supply of water in August on an average for the last ten years, mainly for this reason, or one reason, that they were in no condition to carry it. I will say that two out of three months of August in the last ten years there would have been a good supply of water pass down the Arkansas river, and for the last three years the ditches have used it.
5576*x* Yes, I would say that with the exception of one year, somewhere in between 1893 and 1896, from the first of May to the first of August there has been an ample supply of water for these ditches for at least five or six or seven weeks during that time of every year except the one.

Now, I want to make myself understood here. Our flow of water

down the river usually covers the months from the first of May up to about the first of September. There is not during that time a continuous flow of water, but there will be probably from three to four seasons in that time in which there will be a flood of water going down. Six or eight times within the last twenty years bridges have been washed out of the Arkansas river with these floods. That has always occurred in those months; but in the months mentioned there would probably be short periods in which the water
5576*y* would be low. Yes, it would be a flood that would cause the washing out of the bridge, and I don't suppose that that would be called the normal stage of the river. Why, I want to be understood as going in the record as saying that for the last twenty years during the months named there has been a flow of water down the river every year except one year, averaging from a very low stage up to excessive floods. (Objection.) I don't know what the normal stage of the river is.

5576*z* I think it is in the main correct to say that the supply of water in the Farmers' ditch for the last two years has been entirely satisfactory. I so understand it.

Yes, there is a proposition on foot now for the Government to erect a pumping plant to supply the Farmers' ditch, not to supply the ditch for the present land that is under it, but for the purpose of extending it. There is something like 8,000 acres of land under the ditch now. This Government plant is supposed to supply 10,000 acres, and various persons are talking about 14,000 to 15,000
5576*aa* acres. From what I have read in the newspapers and have heard currently discussed, I understand that the plans of Professor Slichter comtemplate the irrigation of from ten to fifteen thousand acres (objection), and the plant is to cost about $250,000. My understanding is that he proposes to have the farmers who own the 10,000 acres of land under the ditch repay the Government at the rate of about $25 per acre, divided into ten annual payments. I am not now imformed as to the number of payments or the
5576*bb* method. I think there are 8,600 acres under the Farmers' ditch now. I understand the plan is not to be limited to the Farmers' ditch but that the proposition is that the Farmers' ditch is to be used as the carrier and there may be 10,000 acres additional brought under in excess of this 8,600 acres.

No, none of the ditches about Garden City are using water at this time. As to their getting a full supply last year, the Garden City ditch last year furnished water to all demands, and for several weeks when there was water in the river didn't use it because they had no call for it. In 1903 the Garden City ditch was not under the present management.

5576*cc* Yes, such a proposition has been submitted by Professor Slichter, which involves an expenditure of $25 an acre—$2 an acre for an annual rent—for the purpose of getting water out of the underflow instead of the river. I have no opinion to express as to whether it has been favorably received or not. I understand

there has been a meeting called for the 17th of May for the farmers to consider it. I have heard the opinion expressed this far—that if additional lands in addition to the 8,000 acres are brought under the ditch and arrangements can be made to use the same ditch, then those having no rights under the Farmers' ditch are generally expressing a belief that it will be to their interest to come in. Many of the farmers that now have water rights under the Farmers' ditch, as I understand are not willing to surrender their rights to go into that, but as I understand now the proposition is to bring additional lands under the ditch and use the Farmers' ditch as the means of conveyance.

Well, I didn't so state—that these ditches have had an ample supply of water during all of the last ten years. During
5576*dd* that time there has been from three to four months of the year—that is, ten years back—in which there has been an ample supply of water passing down the river to have supplied all the ditches if the ditches were in a condition to have taken it. During the last two years the ditches have been in condition to take it and have taken it. Yes, it is practically true, covering a period of ten years back, that the fact that the water has not been used for irrigation here in these ditches is due to the fact that the ditches have been allowed to go to decay and neglect. The leading trouble has been the condition of the ditches. As to other troubles, one year there was no water in the river at all; other years there were occasional shortages. The year in which there was no
5576*ee* water was perhaps eight or ten years ago. I didn't say that the main trouble was the condition of the ditches, but I said the condition of the ditches was one of the main troubles. The other trouble was some shortage of the water in the river. That has been stated repeatedly in this record—that there has not been an ample supply of water in the river. Outside of that one year ten years ago when there was no water in the river there had been other years in which there was a shortage. I couldn't tell just how many. Perhaps more or less for three or four years. Well, now, it is my understanding that that shortage—when I say a shortage of water for irrigation I mean that there has been a total lack of water at certain seasons of the year. That would
5576*ff* be in the fall of the year and the winter when we would use the water if we had it. As to there having been a shortage of water in the growing season, it is a fact that under practical irrigation the best time to irrigate is in the winter and fall and not especially when the crops are growing. There has been a shortage at times in the growing season, practically for all crops that come under irrigation. Experience has shown that it is the best time to apply water so as to have the land soaked in the fall and winter, and there has been a shortage at that time in nearly all of these years, yes, sir. As to whether this shortage is in any measure due to the taking out of the water for irrigation in Colorado, my answer would only be my judgment, because I can't say that—I

haven't been in Colorado at those times to see the stage of the water there, but I should judge that the taking of the water there has to some extent affected it.

5576*gg* Yes, sir, I think the people here are a unit in favor of using the water for irrigation, and I think they ought to have their share of the water of the river according to the priorities of the ditches, regardless of State lines. Yes, sir, our ditches are claiming a priority of beneficial appropriation over many of the ditches in Colorado, and I do not think the State line ought to interfere with that priority. Yes, it is just what I mean—that these ditches here are entitled to their full appropriation before subsequent ditches in Colorado should take out their water. Well, that is the way we feel here—that we do not believe at the present time that these ditches here in Kansas have had the full

5576*hh* supply that they were entitled to all the time. (Objection.) And we further believe that our failure to get the water supply to which our appropriations entitle these ditches here is partly due to the diversion of the water for irrigation purposes in Colorado in subsequent ditches. (Objection.) Yes, sir, I remember the time the Amity dam went out last summer, and as I have testified, we had an ample supply of water last summer, and the greatest part of the time at which it was used was at a time after that dam went out. The Farmers' ditch was cleaned out and put in working order in the fall of 1901 and spring of 1902. I should say that during the months of May, June and July, 1902, there was an ample supply of water. There was some water in August

5576*ii* that year, and there was some water in the fall, but only a light flow. There was nothing like a full supply in the fall. We didn't have much water in the fall of 1903. There was some used. I recall some small alfalfa fields being watered in the fall of 1903.

The Farmers' ditch back in 1886 was then known as the Kansas ditch.

The water supply during those spring and early summer months generally was good. In the fall it generally was light. In 1883, 1884 and 1885 there was not any attempt made to use water later than the first of October and along in those earlier years, because the contracts expired on the first of October. As to how the supply of water would have been if these contracts had not expired, I could only state my general recollection—that there was more or less water; at times but a short, light flow.

Cross-examination continued.

By Mr. ASHBAUGH:

5576*jj* During the time those ditches were in the hands of a receiver I had no connection with that suit then pending, but I presume that receivers' certificates could have been issued. As to whether they were issued or not, I don't know. I understood there

were some issued for the purpose of paying the superintendent that was in charge of the ditch and for the making of light repairs such as the replacing of the dam and the headgate, which washed out a time or two. There were no repairs put on the body of the ditch.

5576*kk* Yes, sir, there has been a good supply of water for the last two years.

If Colorado has taken the water out of the river, it may have injured our Garden City ditches, because our use of the water has been practically limited to the spring and summer months.

5576*mm* In respect to the times when I said there was an ample supply of water for the last two years, I spoke of the spring and summer use. There was not an ample supply during the winter and fall when we would have used water if there had been a supply.

As to the diversion of water in Colorado during the last two years having injured the Garden City ditches, I will state that I said that I didn't know what the stage of the water was in the fall up in Colorado. (Objection.) If there was a supply there and it was diverted wholly by Colorado, then we were injured by their taking it. I don't know what the state of the water was in the fall.

Yes, I think the people here are in favor of maintaining their priorities of apppropriation over later priorities in Colo-

5576*nn* rado, and I have tried to make myself plain that we have been limited to the use of water in the spring and summer months; that there has always been a shortage of water in the fall and winter months. We haven't used water for irrigation purposes in the winter except to a very limited extent, because there was no water in the river at that time, but that we had an ample supply during the months of May, June and July, ordinarily. I don't mean to express an opinion as to whether we have been injured or not during the months of May, June and July by the diversion in Colorado. We have had practically an amply supply of water during those months for the last two years. I have heard no complaint of a failure to get the water in the last two years during those three or four months. As to the last ten years, there has been a shortage of water at times during the summer months, always during the winter and fall months. As to the diversions in Colorado having interfered with the success of the Garden City ditches, I will say

5576*oo* something has prevented our getting water in the fall and winter. I don't know what the cause is. It may have been taken out in Colorado. Yes, sir, if the evidence in this case shows that Colorado has appropriated three or four times the normal flow of the water and actually diverted it from about 1887 to 1890, I would say that the diversion of practically all of the water flowing in the river through the eastern portion of Colorado has affected our Garden City ditches and the success of them.

Yes, sir, in regard to the amount of water in these ditches, I think the total appropriation, judged from the capacity of the ditches in

western Kansas, would be equal to a ditch 100 feet wide and 3 or 4 feet deep, flowing at a rate that would be indicated by a grade of 1½ to 2 feet to the mile. That is based upon my best knowledge, and I am fairly familiar with all the ditches. I am not familiar enough, however, with the computation to answer whether that would make about 600 cubic feet per second.

As to the rise of the water in the river last Saturday, when it rose about five feet, my best judgment, based upon the informa-
5576*pp* tion I have, is that the water came from Colorado. I cannot speak from my personal knowledge, but I saw from the newspapers that there was snow up in Colorado within the last ten days. I believe there was a snow storm, but don't know how deep the snow was. Yes, I know from general newspaper current reports that there was rain also, and that snow melted during the rain. There have been delays on the Santa Fe trains here within the last five days, and I understand that to have been from that cause. There were several trains delayed.

The rainfall for the year 1904 here was just about normal, but there was more water flowing in the river than usual, and
5576*qq* it was in excess of the water flowing in the river in 1903, yes, sir, and it was in excess of what had passed within the last three or four years. Within the last eight or nine or ten years there was probably as much water in those years as there was in 1903, but in the intervening years there was less.

Redirect examination.

By Mr. HAYT:

No, I don't know anything about what occasioned the delay of these trains, of my own knowledge, nothing except from hearsay, and my information was that the trains were delayed in New Mexico and Colorado, down about Trinidad. I got my information mostly from the "Pueblo Chieftain" and from local informa-
5576*rr* tion of the fact that the trains here were late. I understand that the storms were very great.

My recollection is that the Amity dam went out early in the spring—perhaps in May. It might have been in April. Yes, sir, it took a big flood to take it out, and there was a great deal of water came down the river here at that time. Our Garden City dam went out at the same time, and the flow of water continued to be large for some time thereafter.

Well, I don't know definitely the point at which the Purgatoire discharges into the Arkansas river, only in a general way. My understanding is that it is something like 100 miles, approximately, in Colorado. Yes, I understand it is below La Junta, and
5576*ss* below all of the large ditches in Colorado, except perhaps the Amity. My understanding is that the Purgatoire furnishes the excess of the floods, that is, more than comes from the Arkansas farther above. No, I don't think the Purgatoire is a

larger stream than the Arkansas is immediately above it, but we get more flood water from the Purgatoire than from the upper Arkansas. Yes, the Purgatoire drains a very large country and at times discharges a very large volume of water into the Arkansas. It is a stream that collects larely in rainfalls, and at times it diminishes to almost a dry bed.

5576tt From one to three irrigations are necessrry to grow the crops in this vicinity during the summer. Yes, it has been unusual to irrigate to any great extent in the winter. We haven't had much winter irrigation here.

I was told that there was a little water flowing through the Farmers' canal to-day. There was water, to my knowledge, used in that last October. Up to about the first of November, I think, was the last water, and from that time up to the first day of May there has been very little, practically none, in it, although during the greater portion of this time there has been water in the river by the headgate or intake of the Farmers' canal. Yes, sir, that is true. There has been water running by there this winter, I think practically all the time. I wouldn't say plenty of water, emphatically, but a fairly good steam of water, and at times a large stream.

5576uu I don't think there has been any call for water for the purposes of irrigation during the winter months here. I am not an officer of the Farmers ditch, and haven't been for two years. I am of the Garden City ditch. I don't know of any demand having been made upon anyone for water under the Garden City ditch during the period specified in the last question, to-wit: from the month of October, 1904, to the first day of May, 1905. I don't personally know of any being made.

The proposed location for the Government plant of which I have spoken is about fourteen miles west of Garden City, up near Deerfield. It is to be partially on each side of the river, with a system of wells for pumping, some of which are located on the north and some on the south side, and the intention is to get the water supply by pumping from the sands beneath on each side of the river. As I understand, the system contemplates the watering of about ten to fifteen thousand acres in excess of what might be held under the Farmers' ditch under the present system without taking what they call the Government water.

Recross-examination.

By Mr. ASHBAUGH:

5576vv As to how many acres that would make all together would depend altogether upon how many farmers under the present Farmers' ditch retain it as it now is. Yes, if the whole 8,600 acres that are now irrigated under the Farmers' ditch were increased by ten or fifteen thousand, it would make from 18,000 to 25,000 acres. My understanding of the plan is this—that they will pump to cover approximately 10,000 acres. The Farmers' ditch is to be

used in the sense of a common carrier; that the amount of land to be brought under the combined or double system to be whatever the farmers want to retain for the present system and about 10,000 or 12,000 acres additional; and the two kinds of ditch or river water and water from the Government plant to be conveyed through the same ditch; the farmers that retain the present system to use water only when there is water in the river; the people
5576*ww* that come under the Government plant to be supplied with pumped water when there is not a sufficient amount of water in the river to fill the ditch, and they to have water at all seasons of the year, that is, pumped; the plan being, in a measure, to use the Farmers' ditch as a common carrier, to carry, we might say, the two kinds of water and increase the acreage under that ditch. No, it is not contemplated to use it to supply water in any other ditch, and is limited to the Farmers' ditch. It is to be pumped into the head of the Farmers' ditch on the north side of the river, and is to be pumped from the south side of the river and to be conveyed by a viaduct or pipes to be laid under the river.

Redirect examination.

By Mr. HAYT:

I have read Professor Slichter's report as it was published or put out by the "Herald" here in a supplement a few weeks ago, and my understanding is that he proposes to get the water sup-
5576*xx* ply from what we call the underflow, or the ground water he calls it. I don't know whether it is from rainfall or seepage from the river. It is from what is called the ground water or the underflow water. Well, I read the report and I didn't fix the details in my mind, but I think he does speak of the underflow being supplied from the rainfall.

Cross-examination.

By Mr. CAMPBELL:

Nineteen or twenty inches of rainfall would be sufficient moisture, if properly distributed at the proper seasons, to raise some crops without irrigation. The precipitation of nineteen or twenty inches which I testified to is not so distributed that we can depend upon it for the purpose of raising crops. In explanation, I will say that about a quarter of that probably is in the nature of melted snow that falls in the winter, and the rainfall in the months of April and May is usually ample, and sometimes in June.
5576*yy* But in July it usually is short, with a slight rainfall for the balance of the season. The bulk of our rainfall is in April, May and June.

No, in the season of the year when the moisture is most needed for plant life the rainfall cannot be depended upon, nor for the

later maturing months. We have as a rule sufficient rain to germinate our spring crops, but not to mature them.

In 1898 the precipitation for January was 1.35 inches; February, no precipitation; March, .50; April, .97; May, 6.49; June, 6.39; July, 2.59; August, 2.04; September, 4.26; October, .33;
5576zz November, 1.55; December, 2.07.

The rainfall in May was made up as follows:

May	1st	.56
	3rd	.17
	4th	.48
	5th	.55
	15th	.35
	16th	.02
	19th	.17
	20th	1.20
	24th	.22
	25th	1.35
	26th	.61
	27th	.22
	31st	.59

In June there was a rainfall on six days, pretty well distributed through the month. In July there was rainfall five days, pretty well distributed. I have no record as to the effect of
5576aaa rainfall on the river during these months. Of the precipitation which I have testified about, some would apply generally and others only locally, and I say generally from the fact that there is another observer stationed at Lakin and I receive monthly reports which give the daily markings that at times would run practically the same and at other times would vary considerbly. Generally, our rainfall at Garden City is a little in excess of theirs at Lakin. It generally runs, as a rule, a little in excess of theirs there.

The era of prosperity which I testified about as drawing upon the people here is to some extent due to the fact that the Government is taking an interest in irrigation out here and proposes to put in works to aid in our irrigation of the land. That has given it an impetus, but it has been present for the last two years before any proposition had been given by the Government. We have been seeking for that for several years. If the enterprise that the Government is undertaking through Professor Slichter is carried out, I should judge that some of the land to be irrigated from that plant would be in the neighborhood of six or seven miles from
5576bbb the river, the farthest lands from the river that water would be applied to. Probably the first water that would be used in the ditch would be in the river bottom within half a mile from the river, but the first uplands would be probably a mile and a half back from the river. The lands farthest from the river that

are now being irrigated under the Farmers' canal I think are about six miles from the river, and they come as close to the river as the bottom lands—within half a mile thereof.

5576*ccc* If the irrigated area were to be confined to lands within a mile on either side of the river, the effect would be to eliminate and cut off ninety per cent. of our develpment under the ditches. If the lands that are proposed to be irrigated under the Government project were limited to lands within half a mile or a mile on either side of the river, the proposition would not be taken hold of. It wouldn't be a practicable, feasible scheme at all if *the* limited to that extent. It wouldn't be needed.

Recross-examination.

By Mr. ASHBAUGH:

Examining Complainant's Exhibit A–45, I think I recognize it. It seems to be a photograph of the river bridge and a section of the river to the west of the bridge just south of Garden City. As to that being a correct picture of the river and its condition from

5576*ddd* August, 1903, down to the first day of May, 1904, I cannot to a definite certainty fix the exact dates, but it shows practically the condition from some time late in the summer perhaps August or September, 1903, up until practically the first of May, 1904. It was some time early in May, or about the first of May, when the first flood water came down, in 1904. I wouldn't undertake to give the exact dates, but it was substantially those dates. No, I did not mean to state in my testimony a few moments ago that there was a sufficient supply of water in the ditches in Finney county from August, 1903, down to the first of May, 1904. I think my testimony or what I wanted to be understood was that during the spring months, some years commencing in April and others not until early in May, and running up until approximately into August, and some years there being a shortage in July, but that during the other months of the year—fall and winter—there is usually a very low stage of water. In some years the river

5576*eee* is practically dry for periods of time. Yes, practically dry as shown in Exhibit A–45. I wouldn't undertake to say whether this exhibit shows small threads and streams of water or not, but a very low stage and a very little water passing or running. During the fall of 1903 and the winter of 1903–4 there was no water in the river for fall or winter irrigation, but for parts of the summer there was, prior to August, 1903. Yes, there were freshets from about the first of May, 1904, to the first of October, probably, and there have been from three to six of them, and some of them were above five feet. As to what ditches I referred to in western Kansas as amounting in all to a ditch 100 feet wide and three feet deep with 1½ to 2 feet grade, I meant to include all the ditches in western Kansas that come from the river in Kearny, Hamilton and Finney counties.

5577 NATHAN F. WEEKS, Garden City, Kansas.

Direct examination.

By Mr. HAYT:

I have resided at Garden City twenty-seven years on the 3rd day of this month. I came here in 1878. During that time I have always worked at the carpenter trade some. I have farmed some in this country, and have had some land here. I am working at the carpenter trade now. The point where I farmed would be under what is known as the Farmers' ditch system at this time, located about two and a half miles west of town.

Yes, sir, I have been in Colorado. I first went there in the fall of 1879, and I was in Leadville and that vicinity about one
5578 year, in the fall and spring of 1880. Some time during the summer of 1880 I went into Gunnison, and I think I came back here to Garden City that fall, and have lived here ever since. I have called it my home and have had interests here all of the time.

I had occasion to observe the flow of the water in the river at this point during those earlier years—1878 and 1879. Well, I might say for the three years of 1903, 1904 and this much of 1905; but I don't know as I can speak definitely of them. But two years ago I was in connection with the Farmers' ditch system so that I knew about what it was doing. It seems to me that the flow of water during the first two years I was here was about the same as the flow of water in the river during the last two years. I don't see much difference. I speak that way for the reason that our ditch systems here have supplied us pretty plentifully with water, for two years anyhow last past, more than we had for some years previous.

5579 I was employed on this Garden City ditch when it was built. I had no equity. And on the Farmers' ditch I helped survey quite a bit of that, that is, in the way of laterals, not the main canal, but several laterals I was connected with in that way, and was a patron of that ditch up there.

Yes, sir, when I was in Colorado during the earlier years I had occasion to notice the growth of timber on the headwaters of the Arkansas river in the vicinity of Leadville, and on the summit of the range it was pretty heavily timbered. A pretty large territory was heavily timbered there. Now, that timber is cut off. Yes, the forest fires have helped to destroy quite a good deal of that timber, I will not undertake to say how much, on the headwaters of the Arkansas, because I don't know, but there have been heavy fires there.

5580 Yes, my business as a carpenter and farmer has brought me in connection with the people generally in Finney county, pretty much so. As to what the sentiment of this county is with

reference to the use of the waters of the river for irrigation as against the riparian doctrine which requires the water to be allowed to run in the river undiminished in quantity and unimpaired in quality, I will say I believe I do know. (Objection.) I believe that the general sentiment is that it ought to be used for irrigation. That is my opinion (objection), and I formed that opinion from talking with the citizens of this county and from living here with them.

Cross-examination.

By Mr. ASHBAUGH:

5581 I left Colorado on the 7th day of April, 1905. I was up there twice this year, in January and March, in the employ of the Amity Ditch Company at Lamar or in that vicinity. I have not been in the mountain regions since 1898. I was in the employ of the Rio Grande Railroad Company.

In speaking of the water in the river here for the last two years, I mean the present year, 1905, and the year 1904, and it seems to me that the normal flow of the river for the first years after I came here was about the same as the flow of the river during the

5582 year 1904 and thus far in the year 1905. I am not in position to tell the exact number of feet of water that passed here, but that would be my general observation about it. In 1903 I don't think there was as much water. I just helped to construct the first ditch that was built here; that was in the summer, I think, of 1880. It might have been the summer of 1879. That was the Garden City ditch. It was completed in 1880. I had a little shop in this town and did some work for the people. It might have been in the fall of 1879.

5583 I think there was a pretty good flow of water in those two ditches during the first five years after they were completed. For the next five years I am hardly prepared to say, but I don't think those ditches kept on furnishing water during the '90s. My impression is that a good portion of the time there was no water in the river, and that impression is based upon my general information here.

I don't think that the years 1879 and 1880 were very wet. The summer of 1878 was a pretty wet season. Later than that, in 1878 and into 1879, the drouth continued and was one of the severest drouths ever known. I don't know as I could tell exactly how the flow of the river was in 1884 and 1885. I live in the city here, but have built a great many bridges on the river; but I don't see the river on an average very often.

Redirect examination.

By Mr. HAYT:

5584 Yes, sir, I stated in answer to a question propounded by counsel on cross examination that no water was taken into

the ditches because there was no water in the river. No, I don't
speak that way, that those ditches were not used. I think they
5585 have been used more or less all the time. The headgates have
washed out and the waste-gates have washed out, but I don't know as there was any great length of time there wasn't something done. The ditches were allowed to get in bad repair. Nearly all our ditches here were rather neglected for some reason or other. They were not kept up as well as they are now. Yes, I think for a number of years they were sadly neglected, and a portion of that time I believe they were controlled by people living at a distance, and that they finally passed into the hands of a receiver, and for the time were not in condition to carry much water even though there had been water in the river during those periods. Yes, that is right.

Recross-examination.

By Mr. ASHBAUGH:

As to why those ditches got out of repair, I will say one reason
was that there was not very much of a flow of water in the
5586 river; and on the other hand the companies claimed that the
revenue was not sufficient to maintain the ditch. I expect that is pretty nearly right, that there was not enough water in the ditch to sell to keep it in repair. I guess that is right and the real truth.

Redirect examination.

By Mr. HAYT:

Well, there was another proposition that followed right along. To explain myself, the corporation would come around and exact of you a contract and you would mortgage your crop. You would mortgage anything they could get. Especially your crop would be liable for the water whether you got it or not. Notes have been paid in this county where they never had value received. They were crowded into it, and the thing worked to the detriment of the farmer and he had to quit. He couldn't meet it, lots of them couldn't; and possibly the over-capitalization of these ditches caused an exorbitant charge for the water. I don't know as to that.

5587 GEORGE HILL, Garden City, Kansas.

Direct examination.

By Mr. GREGG:

I reside at Kendall, Kansas, and am a stock raiser, and, I suppose, a farmer. Kendall is located on the Arkansas river about forty miles west of Garden City by railroad, and I own land there. Part

of it borders on the river. The river is the boundary line. I came to Kansas in 1871 and was first on the Arkansas river in 1872, and I have been near the river off and on ever since. I came to Kendall to live in the spring of 1879, and have been along the river almost continuously since that time to the present. My residence has been there.

5588 Yes, sir, I observed the conditions of the flow of the Arkansas river during those earlier years in this part of Kansas, and there were times during those years when the river went dry, yes, sir. I wouldn't like to say just when, but there were periods when the water became very low in the river during the earlier years that I resided there. I think that it was in the early '80s first; that is the water got very low. No, there were not some years in which it was practically dry in places at Kendall, I have heard that it was dry above Kendall, but I didn't see that. But it was very low

5589 at Kendall one year. Yes, sir, I raised crops there, No, sir, I have no ditches taking water out of the Arkansas river at my place or near my place. I have what we call dry farming; that is, I rely upon the rains and upon the water underneath. Yes, I have been raising crops continuously there on that land since the time I located there in 1879. I raise alfalfa and prairie hay and occasionally a patch of rice corn or something of that kind. As to whether those crops are helped any by the water level underneath, I don't see any difference. My crops have been uniformly good during that time. No, sir, I have never had a failure of crops by reason of the water from underneath not being in sufficient — supply them, nor have I noticed that my crops were any less on account of the rise or fall of the river.

Yes, sir, I am acquainted with others residing in that vicinity who do farming and have land near the river. There are quite a number of others there who also have crops and raise them in the same way as I do. Everybody around there does. No, sir, I never

5590 heard any complaint from any of them to the effect that their crops were injured or affected by the lowering of the water level underneath their land. No, sir, I have never had a failure or diminution of my crops on that account.

Yes, sir, I have had wells sunk there near the river on this first bottom land. This land extends back from the river about half a mile, and the valley of the bottom land in that vicinity runs about a mile wide on the north side of the river. I am on the north side. Yes, sir, I have sunk four wells on my land there. There are

5591 three of them about a quarter of a mile and one of them about half a mile from the banks of the river. My lands get higher the farther from the river I go; but this rise is very gradual, yes, sir. I should say that the land on the north part of my land farthest from the river is about three feet higher than next to the river, and about half way back it would be about half of the three feet, or a foot and a half. I dug the first well about a quarter of a mile from the river in 1879, at Kendall. I didn't dig it for myself, but for another

party. Yes, sir, it was on what was afterwards the town site, and that land adjoins mine, and the slope of that land is about
5592 the same as it is on mine. My recollection is that I went about seven feet to water; that is, to the first sheet water. Yes, sir, I kept track of that well and noticed it after I dug it. You could see the water in it at any time. I think that well existed until 1885. Yes, sir, I saw it from time to time, because I repaired the pump when it would get out of order, and I never noticed any change in the water level during those years.

The next next well that I dug was where I live, at my home, and that is about a quarter of a mile from the banks of the river. That was dug until we struck the water and then we drove
5593 through the sand. I think that was in the spring of 1880. No, that well is not there now. The pipe is in the ground yet; I never dug it up. But I am not using it now. I think it was about three feet deep there to the water level. That well was used until 1891. I used it continuously during that time. It was at my house. And I didn't notice any difference in the rise or fall of the water level in that well. No, sir, I didn't notice that it was any farther from the surface then than it was when I dug it. It remained at the same level or practically the same level during those years. As far as I could see, the difference in the level of the water from one part of the season to another throughout the year was about the same.

5594 The next well I dug was where I am living now. I moved to another piece of land, or rather onto higher ground, and that perhaps is about three hundred yards from the second well I dug, and I went about four feet to water. I think that was in 1891. And I am still using that well. I dug it the same as the others—dug to the water and then drove a pipe. The well was about three or four feet across down to the water level, and I have used that for household purposes throughout the year and am still using it. The water in that well has practically remained the same and is
5595 the same to-day, yes, sir. Yes, sir, I dug another well about forty rods north of where I am living now, or the well we just spoke of, on the same land, and I went about six feet for water and constructed it the same as the others. That was three years ago. That was in constant use until last winter. Yes, sir, I noticed from time to time the water level in that well, and there was no change that I could notice. It remained practically the same during those years.

I have two wells or pumps—pipes—for stock use, to pump by hand. Those are nearer the river than the one at the house, but on the land, and I should say about half a mile one way and a quarter of a mile the other from the river bank. The river bank is
5596 irregular there. I went about four feet to water in them. They were dug the same as the others, and are in use yet. I didn't notice whether the water level rose and fell in those from time

to time. Yes, sir, I have seen it from time to time, and there was no change in the water level that I noticed.

Yes, sir, the Santa Fe road also has a well there at their station. That is perhaps three hundred yards west of my deepest well. The railroad company went about eight feet to the water level. That was in 1882, as I recollect. Yes, sir, I am acquainted with the supply of water in that well, and there has been no change in the
5597 water level that I have ever noticed, only when it was pumped out. No, that well is not now in use. They use it sometimes. They have a deep well now, four or five hundred feet deep, to get soft water, and they have abandoned the old surface well. Yes, sir, I think it is better for their engines to get the deep water than the surface water. Oh, yes, all the residents there in that community have wells that are sunk in this bottom land. Yes, sir, there are persons living in both directions from me, both east and west, and all of them have wells. No, sir, I have heard no complaint or suggestion that the water level of the wells has been lowered in any way. I never heard that they were raised or lowered by the rise and fall of the river. I have never been troubled with any
5598 of my wells in getting a water supply by the rise and fall of the river. As to the conditions east and west from where I am with reference to the wells, I should say it is the same all the way along the river bottom. No, sir, I have never heard any complaint from anyone either east or west who is taking water from these wells on these bottom lands that the level was lower than it formerly was in the earlier years, nor do I know of anyone who has complained of their crops being affected by the falling of the water level underneath the bottom lands, and with the exception of allowing for the age of alfalfa, which will, as it gets older, without irrigation, necessarily grow shorter, perhaps, the crops in that vicinity are as good as they were in earlier years. That is my observation. And they are not affected by the water levels, no, sir.

Cross-examination.

By Mr. ASHBAUGH:

My land extends back half a mile from the river. It is
5599 about five feet to water at the river bank. It is a little higher there than it is on parts of my land. At the lowest part of my land it is about three feet to water, and on the highest part of my land about six feet. The land upon which I have raised alfalfa has a water level under it not to exceed six feet in depth. I believe alfalfa roots would go down into that. If the water level should fall two feet, I expect the alfalfa roots would still go down into it. Yes, alfalfa roots will go at least eight or ten feet into the water level to get sufficient moisture. Yes, the water level might have changed it two or three feet and I not notice it on my alfalfa at all. If I were raising sugar beets or corn or something of that kind the roots of which did not go down, then if the water level changed two or three

feet it might affect the crop. In speaking of other crops that
5600 have not been injured or of others not complaining of it I was speaking of crops similarly situated as to the advantages of the water level as on my land, yes, sir. Yes, sir, the best alfalfa lands along the valley is where we strike the water level at about three to five feet, and this water level might change from within three feet of the surface to at least seven or eight feet of the surface and not affect the alfalfa crops very much. If it should go below eight feet I don't think it would affect the alfalfa crop. I have seen alfalfa roots twelve to fourteen feet long. In some places you can get the moisture too close to alfalfa. Two feet would be too close. Because I know of patches and places where it was drowned out where the water was too close to the surface. The land under
5601 those conditions will heat and bake and will burn out the little roots that are near the surface. If the water level should go down to fifteen feet I think it would injure the alfalfa crop to some extent.

As to the flow of the river since 1890 as compared with the flow of the river before that time down to 1904, I will say I couldn't tell exactly what years the river was high or low. (Objection.)
5602 But there have been times when there were large bodies of water coming down and there were other times when it was very scarce. I think that the normal flow of the river from 1890 to 1900 was less than the normal flow of the river from 1880 to 1890. Yes, the year 1904 was a very wet year, and a great deal of rain, and a great deal of water in the river coming down when there was no water in Kansas, yes, sir. I think there was one year, 1886, prior to 1900, when the river was dry. I wouldn't be positive as to
5603 the year. That is the only year I remember of from 1879 to 1890 when the river was practically dry. I remember it being dry one year between 1890 and 1903. I can't remember what year.

Yes, I think the dry periods are longer now during the last ten years than they were during the first ten years that I observed the river. It seems that they begin earlier in the spring and last longer in the fall.

Yes, I remember such a thing as a June rise in those earlier years. The river would come up and stay up quite a while. During the last ten years I wouldn't state about that. I have not observed it closely enough. But I don't think the June rises
5604 last as long in these later years as they did in the earlier years. As a general average during the last ten or fifteen years, the June rise does not come as high nor last as long as in the first years. In the last years when there is a rise they come more suddenly and go more suddenly.

Recross-examination.

By Mr. GREGG:

Yes, there could have been a rise or fall of two or three feet in that water level without my noticing it in my wells, because we don't use the surface water. We drive a pipe beyond the surface
5605 water. Yes, when we strike the first level we see it. We can see the first level through the platform of the well. I don't think that level could have gone down two feet without my knowing something about it. No, that is a fact, that during the last ten years I didn't notice particularly enough to State definitely how often the water had been low or high in the river, and I couldn't state how often it had been low, or what years, no, sir, because I have to depend upon my recollection. Only once did I notice the river particularly enough to call my attention to it during these years, and that was the year I spoke of; but outside of that the change was not enough to really call my attention to it or to fix it in my mind, no, sir.

Recross-examination.

By Mr. ASHBAUGH:

No, sir, I never heard of anybody driving a flock of sheep down the bed of the river from Colorado when there was no water in it. If anybody did that I don't remember it. And I think I
5606 would have been apt to have known it. If they did that it was at times when I didn't know anything about it. At least I never heard of it.

Redirect examination.

By Mr. GREGG:

Yes, sir, those sheep might have gone down there without my knowing anything about it.

I have raised prairie hay, sorghum, rice corn, kaffir corn and stuff like that in addition to alfalfa upon this bottom land, and these crops are generally raised upon the other farms there in that vicinity, and during all of the years I have lived there I have never
5607 had a failure, and that has been my experience since I originally located there. This rice corn I spoke of is a species of sorghum, only it makes a larger head and a better corn, and it is cultivated like corn. This has also been raised by me on this bottom land, and by others in that vicinity. No, sir, I have never heard any complaint about that crop being affected by the falling of the water level in the valley, because we depend entirely upon the rain to raise it, because we can't irrigate it. Yes, we also raise kaffir corn and sorghum on this same bottom land, and I have never figured that I was ever affected by the falling of the water level underneath the land. There were none of the other farmers affected so far as I know, no, sir.

Recross-examination.

By Mr. ASHBAUGH:

I know very little about the underflow, and have not paid much attention to it. There are parts of my land that I know are not sub-irrigated, for it is too deep to the water, and we depend entirely upon the rainfall to raise our crops.

DODGE CITY, KANSAS, May 3, 1905.

5609 R. S. CRANE, Dodge City, Kansas.

Direct examination.

By Mr. GREGG:

I am thirty-seven years of age, and reside at Dodge City, Kansas, and have lived in this county twenty years last September.
5610 I was located down here fifteen miles at a little town called Spearville for a short time, and while I was there I did whatever I was able to do to make a living. I worked in an office. I have never taken up any lands in this county. I am now engaged in the real estate business in Dodge City, and have lived here twenty years. I am engaged in selling lands—handling lands—in the real estate business in this county, and handle them upon a commission, and also have lands of my own here. I have only 16. acres of my own and the balance of it my partner, Mr. Russell, and myself own together. We have about 3,300 acres in that way. Yes, sir, I am acquainted with the farming community in this vicinity, and am well acquainted with the lands along the Arkansas river here. Of course I was very young when I came here and didn't pay much attention to those matters then. Oh, yes, I
5611 have been out over the county and know most of the people around here.

Well, of course in the early years there was not the crops in there is now. The land wasn't in cultivation like it is now and there wasn't near as much then. Yes, sir, a good many of the lands then were what are called grass lands. Well, comparing those grass lands in the earlier days with the grass lands of the present time, I think the grass lands now are better than they were then. No, sir, I don't know of any grass lands along the river which have fallen off in productiveness in more recent years. No, sir, I haven't heard any complaint among the farmers or others in this vicinity to the effect that the grass lands have been poorer or worse in these
5612 later years than in those earlier ones. Oh, yes, they grow a a great deal more alfalfa now than they did formerly. In those former years there was not hardly any in alfalfa. Well, in those first few years, from 1884 up to 1890, there wasn't hardly any in alfalfa that I know of. Of course there might have been some, but I don't know. I think there was a strip of land up here that was in alfalfa, but that is all that I know

of. And take it from 1890 to 1895 as compared with the last five or six years, I think the alfalfa land has increased fifty per cent., and from 1895 to 1900 it has increased right along every year, yes, sir, constantly. Well, I couldn't
5613 say as to the productiveness of the land in raising alfalfa, comparing those earlier years with what it is at the present time, but I think it is about the same. Yes, sir, I suppose some years they have had local causes, perhaps, that might have affected the alfalfa crop. A short time ago for one year we had grasshoppers here. As to whether or not the productiveness of these lands along the river is just as great or greater at this time and during the last five or six years as it was during those former times (objection), I would say I think so, yes, sir. No, sir, I haven't heard any complaint from any of the farmers in this vicinity to the effect that their grass lands are not as good as they were in the earlier
5614 years. (Objection.) I haven't heard any complaints. No, sir, I haven't heard any complaints among the farmers to the effect that the crops are not as good or have been reduced on account of the water level being lowered or anything of that kind. (Objection.) Yes, I think these lands raise just as much or are as productive during the last five or six years as they were in those earlier years. I think they are. Yes, sir, I am acquainted with the land values and have been acquainted with the land values along the Arkansas river in this (Ford) county and in reference to the value of lands in those earlier days as compared with the value of lands at the present time (objection), I would say of course in 1886 and 1887, that is, the uplands, I expect they were as high then as they are now. Perhaps higher. That was during what we call
5615 the boom times, yes, sir. I have no idea of the values before 1887. Yes, sir, it is true that after those boom days a great many people moved away from here. The value of lands for the last seven years has been increasing. They have increased, I expect, six hundred per cent.; that is, the uplands, since 1897 or 1898, and the bottom lands have increased also, but not so much. I would say the bottom lands have increased about fifty per cent. That is, steadily rising, since 1898. (Objection.) Yes, sir, and the prices or value of these lands are higher now than at any time since the
5616 boom times. I would say that the general average value of bottom hay lands in this vicinity is about $35 an acre, and those same lands about 1897 and 1898 were offered at about $15 or $18 an acre, and of course the second bottom lands were not so high. In 1897 and 1898 the second bottom lands were running about $10 an acre and now they are about $15 to $20 an acre, somewhere in there. As to alfalfa lands on the first bottoms in 1897 and 1898, well, sir, I don't just know. They were so high that we were not able to handle any of them, and they are still higher at the
5617 present time, yes sir. It is hard to place a value on land that is in alfalfa or that is alfalfa land, because when they have a crop it makes so much per acre that you can't hardly put any value

on it, but they are of greater value now than in former years, and have increased right along within the last seven years.

Cross-examination.

By Mr. ASHBAUGH:

In speaking of "when they have a crop" of alfalfa, I say they generally have a crop every year. I mean by that a seed crop, you know. They don't always have a seed crop that amounts to anything. There are a good many reasons for that. For the last few years it has been because of the grasshoppers getting in on them. Yes, pretty nearly all of the alfalfa in this county is confined to the bottom lands. Yes, it is a variable crop from year to year. I don't know just exactly what causes that variableness. They generally have a hay crop right along every year, but I think that the
5618 past few years it has been the 'hoppers. As to the last year, there was some pretty fair crops and some that were not so good. The grasshoppers are a kind of local trouble. I don't know, sir, how far above the water level the alfalfa lands are along the bottom lands. I think on the first bottoms in this county they go only a few feet for water, I should think ten feet, and on the second bottoms fifteen to twenty feet. I think you can get water on the first bottoms at ten feet pretty nearly anywhere along that river, and I think you can get it at a shallower depth than that on the first bottoms. As to how shallow, I haven't any idea, I am sure. As I don't own any of it, I haven't tried about that, and that depth may not be correct.

5619 Yes, I came to this county in September, 1884, and located in Dodge City in 1885. I was in Oklahoma half a year. When I came here there was an island down here in the river, and there is an island over there yet for that matter; that is, they call it an island. Yes, I believe there was a short bridge to the island from the north side. Yes, I remember Mr. Wright having a store there, known as the Island store. It was on what they call
5620 the island. That bridge from the north side is not there now. It was taken away, if I remember right, about 1888 or 1889. I am not sure about that. As to why they took it away, it has filled up in between there. It has all filled up now. No, there is a drain through there, tiling, I think, a drain of twelve-inch tiling, to drain the part that has overflowed there. The city park is located in the south part of the town next to the Arkansas. I don't know that you would call the city park an island. The water used to back up in there, but the Arkansas has changed to the south side. I can't remember when the trees were planted
5621 in the park. (Objection.) I think they were here when I arrived, though I am not sure of it. I remember in 1885 and in 1886 the trees down there were very small. The trees that you can see from the window of the room at which this testimony is being taken I think have all been planted since I came here.

Well, sir, I haven't any idea how wide the river was when I came here. As to how wide it is now, I think it is about the same. (Objection.) As to how wide the river is through Ford county,
5622 I haven't any idea of how wide it is. (Objection.) It is not half a mile wide, and I am not sure about it being 500 feet wide. I presume it is very nearly that, but I don't know, (Objection.) I have no idea as to how long the bridge at Dodge City is. I don't know, sir, whether when I came here there was a lot of land that is now in trees that we can see from the south window of this room. (Objection.) No, sir, there were not many trees here in Dodge City when I came here. I think the trees that are here now have been planted since 1885.

5623 As to what caused the rise of land values in this county in the last few years, I think that the crops have caused it mostly, and the country filling up with people. Dodge City is a larger town now than it was ten years ago, and a better town, and more money, and better buildings, and more business.

When I said that I thought the hay lands were as productive in the early years, by "early years" I mean back in 1887, 1888 and 1889. In those early years there were men that hauled hay from the lands along up the river, and they are hauling it yet. It was wild river hay. I haven't any idea, I am sure, how much of it grew to the acre then, and I don't know how much grows to an acre now. I haven't heard of it decreasing any. As to Mr.
5624 Wright, I am sure he has always cut hay down there. I think the crops that he cuts there of wild hay now are as good as he used to cut there in the early days back as far as I can remember. I have no idea, I am sure, how deep it is to water there on that bottom hay land.

Oh, yes, we have heard of the underflow in this county. I never heard of the underflow until it was talked about in connection with the irrigating canal. The Eureka irrigating canal runs north of here about a mile and a half. The headgate is at
5625 Ingalls, twenty-five miles up the river. Yes, I remember when there was water in that ditch. That was in 1888. But I have no idea how much land was irrigated from that ditch. As to whether there was just a little or a good deal, I haven't any idea how much. (Objection.) I know that they used it, though, but to what extent I can't say. I have no idea as to any connection between the underflow and the Eureka ditch. I say I never heard of the underflow until they talked of tapping what they called the underflow to supply that. Yes, sir, I have heard of the South
5626 Side ditch. I don't think it was an underflow ditch. I think it had an opening up there at the river. I can't say, though. I don't know whether its source was at the Arkansas river. (Objection.) I couldn't say. Yes, I have seen water in the South Side ditch, but there is no water there now. I don't remember when they had water in that ditch, I am sure. As to how long it has

been since there was water in the Eureka ditch (objection),
5628 well, sir, I have heard they have had it in there as far as Cimarron within the last year or two, but I don't know that that is true. I have heard so, that is all. I have no information upon it. As to what effect the presence of the river and the
5629 amount of water in it has upon the growth of crops on the first bottom lands, I don't know. No, sir, I don't know whether those lands are more or less productive by virtue of more or less water being in the river. I only know that there is more raised than there formerly was. I think that the crops are better cultivated through this county now and for the last three or five years than they were the first three or five years after I came here. I presume they have better machinery, better barns, are better prepared to take care of their crops and better prepared to cultivate their crops than in the earlier years. Yes, sir, the uplands have in-
5630 creased in value more rapidly than the bottom lands, because the uplands were so cheap that they didn't seem to have any value. When I first came here in 1884 of course the uplands were then in demand, and they depreciated along about 1888 and the values dropped out of pretty nearly everything. All through here a great deal of land was proved up by men that came out here that had no idea about farming. It was not their intention to farm. The uplands during those first years were used somewhat for grazing purposes. No, sir, not all of the cultivation during those early years was confined to the bottom lands. The lands along the river
5631 when I came here were not cultivated very much. The people hunted the uplands for farming. They thought they were better.

I presume they have some wells on the first bottom lands but I don't know of any; and as to the depth of the water in our alfalfa lands, I don't really know much about it.

I don't know exactly the population of Ford county. Last year I think the county clerk said it was about 6,500. The population of Dodge City is about 3,500, I guess. When I came here I think the population of Dodge City was about 3,000. The population
5632 of Dodge City in 1890 was about 1,900.

No, sir, I don't know that the presence of water in the river has affected beneficially or injuriously the agricultural interests of the lands I have spoken of.

Redirect examination.

By Mr. GREGG:

Well, no, there is no cultivation of grass on the bottom lands. We don't cultivate ground for grass; and that is true as to alfalfa after it is once planted. It is simply grown from year to year.
5633 No, sir, I can't say that I have noticed any particular difference in the width of the river now from what it was in those former years. So far as my information is concerned, it is

about the same. Yes, I think it is true that the river shifts its bed from time to time and that it has shifted to the south as a matter of fact away from where these trees now are, and these trees have grown upon the land where formerly the river might have been. Yes, sir, I think so. No, the south bank has not gone south as far as the north bank has gone south. I think not.

5634 R. W. EVANS, Dodge City, Kansas.

Direct examination.

By Mr. GREGG:

I am sixty-four years of age, and reside at Dodge City, Kansas, and have lived here about thirty-two years—since 1873. Well, I have been county treasurer, I guess for two and a half years, and have been mayor of Dodge City for one term, I think, and have been postmaster for four years. Those are all the offices I have ever held. Yes, sir, I had connection with one of the banks here for some time—about eight or ten years. I was cashier of the First national bank. We organized this bank; and they had a bank here before that.

I have been on the Arkansas river in this State since 1862. The first time I went from Pueblo down to about where Great
5635 Bend is, I guess. I have forgotten exactly where we did leave the river. At that time we were not more than an ordinary soldier's march upon the river. I belonged to the Second Colorado cavalry, and we went down with them. We walked down, of course. We had no horses, only a few of us. We came on down this way to Larned and stopped about a month. Well, we were not on the river when we came. We camped up where Fort Larned was, and I think we went down to a road that goes over to Harker, I think, where Great Bend is now. That is my recollection. I never got down the river again until we came back here after the war, in 1873. Before the close of the war I came back here, when the Indians broke out. We were sent back here and camped in the winter of 1864–5 at where Great Bend is now, on Walnut
5636 creek. We camped all winter there, nearly. We were never quite on the river again until 1873 when I came here to live. From 1873 I have lived in town here. I suppose once in a while I went down to the river; not very often, though. Yes, the town here is right on the river, about a quarter of a mile, I guess, from the business part. Probably one-eighth to a quarter of a mile.

Well, in the early part of the seasons the flow in the river was pretty fair in the early years, but it generally got pretty dry about the last of them, after the June and July freshets came down, and to the best of my recollection the river used to go dry in the fall. As to whether it was a matter of general occurrence for the river to run dry during those years (objection), I really couldn't say upon my

oath, but that was the impression I had on my mind always, but when I swear to a thing—I didn't go down to the river and my recollection is not good enough to say, but my impression is that it always got dry late in the fall, yes, sir, in a great many years.

5637 As to whether or not it is a fact that in nearly every year at some time in the year the river ran very, very low (objection), I think it did, but I would like to add that it is merely the impression I had on my mind. I wouldn't pretend to be confident of what I say always in all these things. It is merely the impression that is on my mind, that is all. Yes, sir, I know something about the general condition of the river at the different seasons in those years during the time stated, just like anybody else that is not very observing. As to the condition of the river in 1875, I don't know. I don't think I remember that year particularly. I think it was a pretty dry year, though, 1875 was. That is my recollection. Yes, I think I stated that the river went dry in that year; that is my impression, that it did; and nearly every year it got very low, yes sir. Well,

5638 the time of the year that it ran low was generally about the last or middle of August. It gets pretty low from that on. It is generally pretty dry in the fall, and it is my impression that it was in those early years too, but not quite as much as in the last ten years, according to my recollection. As to the flow of the river in the last two or three years as compared with those earlier years, well, I think that in the last two years we have had a little more water than usual in the river. Yes, sir, a little more than in those earlier years. Well, not the right early years, but take it say up to 1880 I think we had a better flow, some. Well, taking the period from 1880 up to the present time, the flow is better in the last two years.

In regard to the crops in this vicinity, well, we didn't raise

5639 any crops in the early years here; and as to the crops and grasses that were grown in those early years as compared with what has been raised during the last four or five or six years, I would say I think they are improving right along. I think we have better crops now than when we started in; and as to the grass crops, I think they are pretty nearly as good now and probably better than we had then; that is, we have more cultivated grass now than then, a good deal. Well, I couldn't say as to the comparison with the grass lands of those earlier years, taking it acre for acre, because I didn't pay much attention to the grass then. Nobody thought of such a thing, I guess. We got all the hay we wanted, and that is all. Now we know we are getting more than we used to have. Yes, that is true as to the land along the river. It is better than it used to be, I think. That is my opinion. No, I don't think I have heard any complaint among the farmers in this vicinity as to their grass lands being less productive than in the earlier years; and as to the value of lands in this vicinity in those early years as compared with the present time, say the last four or five years, it is higher now, of course, a good deal, than it was then.

Comparing the values of lands from 1880 to 1885 with the present time, I would say they are a great deal higher. Well, during
5640 the boom time here they got pretty high, but then you couldn't get much of a criterion because the people came here and settled and borrowed so much money on a quarter section of land. It was not actually a sale. It was merely borrowed from the eastern fellows, and then they left the land. That has been the condition we were in in those boom years.

As to the value of lands adjoining the river from 1897 up to the present time, I would say they have improved in value, probably a hundred per cent. anyway, in my opinion. Yes, it is true that the value of most lands along the river, including bottom lands and the second bottom, are higher, I guess, now, than during the boom times. Yes, sir, the crops and the value of land for several years past have been as good and better than in the earlier years, and I believe it is true that land along the bottom and second bottom and the uplands are more salable now than at any time formerly, yes sir.

Cross-examination.

By Mr. ASHBAUGH:

5641 Yes, sir, Dodge City is on the north side of the river, and this court house is perhaps a mile from the river, and we can see the river from the south windows, and we can see a grove down there. I have forgotten what year that grove was planted in, but about eighteen years ago, I guess. Probably some of those trees are growing in the old river bed, as we saw it at first, but not many. I don't know that the river bed has narrowed much. (Objection.) I think it is cutting in on the south side and building up on this side right around here. It is cut away considerably on the
5642 south side, but I don't think it has cut fifty feet. Up above town here I think it is filled in ten or fifteen feet on the north side. I don't know how wide the river bed is between the banks through Dodge City. (Objection.) I cannot give much of an estimate of it. Yes, sir, I remember when there was an island down here with a bridge connecting the north side with that island. (Objection.) I don't think that bridge is there now, but I haven't been over there for about six months. I don't know that that bridge has been there for the last ten years. I think it has
5643 filled in. Yes sir, that has all filled in now and covered with trees and is a part of the forest that you can see from this window. Yes, I think there was a store there. Yes, sir, it is all main land from that island north now. (Objection.) Yes, the river looked to me as though it had more water in it for the last two years than before, and I mean by the two years 1904 and 1905. Yes, sir, 1904 was a very wet year. I believe there was a good deal more water came down the river from heavy snows and rainfalls in
5644 the State of Colorado and New Mexico during the year 1904. Yes, there were a number of very heavy rains in those days that

kept the river flowing a good share of the year 1904. Yes, sir, and I said that condition in 1904 was about the condition of the river as I knew it down to about 1880. Yes, sir, and I said that the river fell off after that and became very much drier than in the earlier years. I think it is a known fact that for the last fifteen years prior to the year 1904 there was not so much water in the river as there was during the earlier years as I knew it. (Objection.) That is my recollection. Well, I don't know that the crops increased in the valley land during the last ten or fifteen years because of there having been less water in the river. I think you can get a crop there
5645 any year whether there is water or not. I couldn't tell about whether the falling off of water in the river has tended to increase the crops or the value of the land. Yes, sir, the cultivation of our crops in this county is better now than it was twenty years ago. They have better machinery, more money, and the farmers are in better condition and do better farming. Yes, during the early years, from 1883 and for the next ten or fifteen years, we had some prairie fires, and these fires burned the hay off the hay land. Those prairie fires didn't tend to make our crops in the early years better.

Yes, I believe that during the last twelve years prior to 1904 we had longer dry spells than during the earlier years. I don't know as to the dry spell increasing at both ends—coming earlier and lasting longer—but I guess it does, though.

5646 Yes, sir, I have heard of the June rise. They were generally here about the first of June. I don't believe it varies much from that. As to the origin of that June rise, I think it was snow in the mountains. I always supposed it was. No, those June rises didn't altogether come from local rainfalls. We always had that whether we had rains here or not. I have seen some of them come two or three feet at a time. As a general thing, though, they were more gradual than though they had come from a freshet by a rainstorm here. Those June rises would last about a month, I guess. A month would be a fair average. And sometimes they would last six weeks. O, yes, we have had them every year during the
5647 last twelve years. I couldn't say that they come to as great an extent as they did in the earlier years. I don't hardly think they do affect this north side of the river as much. I don't know how it is on the south side. Probably these June rises in the later years haven't been as great as in the earlier years. I don't know much about that.

As to how deep you can get water on the first bottom lands along here, you can get water on the first bottoms in two or three feet, I guess. I don't think the depth of water under the first bottom lands depends upon the condition of the water in the river. (Objection.) Oh, yes, we find the water under these first bottoms nearer the surface after the river has been up for a time. That is true. And after the water has gone down in the river it probably
5648 goes down some. But then the best test I know of is the water works here. They are down a few feet and they always

have plenty of water there. I think if you go down deep enough you will always strike a bed of water in the valley here. Yes, I think the water rises in the water works well here after the river has been up for a time, and after a fall in the river it gets lower in the well, but there is always plenty of water. I don't know how deep the water works well is. It is down into the first bottom ten or twelve feet, probably.

Redirect examination.

By Mr. DAWSON:

I don't know what the distance of the water works well from the river is, I am sure, but less than half a section of land would cover it, I guess, between the well and the river bed. Probably a thousand yards, I should say, from the water works to the river. That is merely a guess, however. I think the character of the
5649 ground where it is sunk is sand and gravel mostly. No, sir, I don't know how much the water in that well varies at different times. I don't know whether it is a foot or four feet. I should think, however, the variation is very slight, except when we have a heavy freshet. Then I guess it has in one or two years run in over the top, right in over the surface. As to whether the wells are so near in the bed of what is the old channel of the river that when the river gets very high they have trouble to keep it out of the wells, I would say I think they build up around now so as to keep the water out. I think so. Yes, it makes no difference how high the river gets or how long it stays dry, there is always plenty of water in the wells.

Yes, I have been pretty nearly to the headwaters of the Arkansas river, I guess. I have been where I could step over it. I
5650 have done business up close to the river for several years in Colorado; that is, I had a man there and I used to go up and stay a month or two at a time. That is at Brown creek, about fifty miles this side of Leadville and a little below Buena Vista. It is not on the river but on a creek. No, all of the snows in the mountains above timber line or near timber line are not gone before this June rise I speak of gets down here, not all of them. The snow disappears about the first of June, though, as a general thing, and the great bulk of it in Colorado disappears before the first of May; that is, in the valleys it does. No, not on the foot hills. You can get some snow in the foot hills. Yes, it is true that after the first of May the only snow you can find lies high up in the mountains.

In regard to the island I spoke of here in the river, the principal stream in the early days flowed on the south side of it. Yes,
5651 that was always true. There was not much of a stream that flowed around on the north side of the island in ordinary times when the river was not high. Probably one-fifth as big a stream as the main one on the south side.

I think the force of the current coming from above has been to

the south, and that it has cut into the south and filled in on the north side of the river. I know that to be a fact up above town here. I owned some land there, and it has made several feet of land there. The river is changing its channel somewhat, yes, sir; and taking advantage of that condition I think the people here did fill down here in places, yes, sir. I think they have filled in some there.

Recross-examination.

By Mr. ASHBAUGH:

Yes, I think they began filling in the channel on the north side of the island before the water ceased to flow there. All that channel is now filled up, and I don't think there is any water running there where it used to, and the trees are growing all over that place.

5653 JOHN D. SIDLOW, Dodge City, Kansas.

Direct examination.

By Mr. GREGG:

I am fifty-eight years of age and reside at Dodge City, in Ford county, Kansas, and have lived here about eight years. I have lived in the county about twenty-nine years, since 1876, in which year I first came to the State of Kansas. I came out here to take up a soldier's homestead in western Kansas at that time. Yes, sir I was a soldier at one time, and I took up this homestead in the northeast corner of Fremont county. No, sir, not along the river; it is about six miles from it.

Yes, sir, I was upon the Arkansas river frequently in the year 1876. I put up hay along the river in that year. That was
5654 on the banks of the river. At the time I was putting up this hay there was considerable water in the Arkansas river. That was along in July or August some time. I don't remember exactly.

Well, the first time I saw the river was in the latter part of February or the first of March, in 1876. I got off at Kinsley, and during the first day I was there I went down the river and saw it at that time. It was very low. I saw a man go across it on foot. He said he hadn't gotten his feet wet going across. There was some water flowing in the river, but very little. There were small channels, yes, sir, but a man could walk across without any trouble or without getting his feet very wet. It was not over boot top deep. Yes,
5655 sir, I have frequently seen that grass land which I then cut hay off of since that time. The last time was quite a while ago, probably eight or ten years, and it was still in hay, and the condition of the growing hay then was about the same as it was in 1876. No change in the ground I cut over. It was on the first bottom.

I was on this homestead I took up about eight years, and I saw the river frequently during that time, and nearly every year it would get very low so that you could cross it without any trouble, especially in the year 1879 when there was no water in it whatever. It ran entirely dry that year, yes, sir. Nearly all that summer it was perfectly dry. I think there was a little water in it during the fall, and there was very little water in it until along in July
5656 of 1880. As to what would call my attention to the fact of its being dry, I would say that from where I lived I could see the contour of the river, you might say, just by the flying sand blowing out. It was a very sandy summer that summer; and I mean to say, yes, sir, that I could in a general manner trace the course of the river by reason of the wind blowing the sand in the bed of the stream, and that was distinctly visible from my place.

Well, in 1880, in July, there was a flood of water came down the river. I think it was in July that there was a rise in the river. And there was considerable water in it for some time after that, but I don't distinctly remember how long it lasted.

Yes, the river during the dry season in nearly every year is very low. There were very few years but what it would get very low at some time during the year. There is hardly a year but what you could cross it. So that the matter of it getting extremely low was a matter of general occurrence through these years, yes, sir. Why, our experience is that it gets very low during the dry season
5657 nearly every year. And that has been true, practically so, ever since I have been here, yes, sir.

Well, I don't think there has been very much change as to the flow of the river, say during the last three years, as compared with the general conditions during those earlier years. I don't think there has been quite as much water coming down as there was in—that is, the high water wouldn't last as long as it would in some of the former years. I have seen it several times when the stream was entirely stopped running in those earlier years, but within the last three years I have not noticed it. I have crossed it frequently, but haven't noticed but what there was a small stream running. Yes, sir, there has been a good flow of water during the last three years.

Yes, I am well acquainted with the lands in this vicinity along the Arkansas river, and in those earlier days there was a great deal of grass land along the river, and there is considerable, yes sir. I think the production of those grass lands along the first bot-
5658 toms in the earlier years was about the same as now; and as to the second bottoms, well, I think the grass land on the second bottom has increased, and I account for that—for one reason, I suppose they haven't been grazed so closely, and the fires haven't run over them so much, and that blue-stem is taking hold. There hasn't been any perceptible change that I can see in the production of the grass lands along the first bottoms between those years and now.

Yes, sir, I was connected with the Fort Dodge soldiers' home for a while as quartermaster. I think I went there in that capacity in 1893 and was there a little over five years. Yes, sir, they have some grass lands on the border of the river there belonging to the soldiers' home, and I was well acquainted with the production of those grass lands. Yes, sir, I saw those lands before I went there as quartermaster; and I should think that the grass lands that we used at the fort there some years were used as grazing lands, so that I could hardly compare it. There was a good growth of hay
5659 there. There was always a good cutting of hay on those lands, and that was true all the time I was there. No, sir, I never heard of those grass lands being rendered less productive because the water level had fallen. Nothing of that kind, no, sir. No, I don't know what the production of those grass lands has been during the last three or four years, of my own personal knowledge, only have noticed in passing by that they have put up about the usual amount of hay there, but I have no knowledge of just what is —— I should judge that there was in the neighborhood of fifty or sixty acres of
5660 grass lands that were mowed over there when I got there. They raise alfalfa there also, yes, sir. The alfalfa land is on a bench that runs up to the river. It is not really the first bottom; it is right next to the river, but it is higher land than the wild hay land is. And they had good alfalfa there during the time when I was there, all the time, yes, sir. I think the alfalfa was sowed the year before I went there, and I think it has continued good up to this time. Part of it has been fenced into hog lots, I notice, and the hogs have destroyed it to a certain extent.

No, sir, I don't remember hearing any complaint or any suggestions that the alfalfa lands have deteriorated on account of the water level being lower, and I think the crops produced there today are just as good as they ever were.

5661 As to the value of the lands of the soldiers' home at the present time, or say during the last six or seven years, as compared with those earlier days, I would say that the market value is very much more than it used to be, and that includes the grass lands. Yes, generally, the land out there is just as high now as even in the boom days. I don't remember of ever hearing any complaint by the farmers down there through that section of the country or along on the lands bordering on the stream along the river on either side of Fort Dodge that their hay or alfalfa lands or the crops on any of their lands had been hurt or affected by the lowering of the water level.

My experience is that the second bottom land is better for alfalfa, and I account for that as a general thing for the reason that the first bottom land is too close to the water and when the water is up it appears to rot the roots. That is, the roots get into the water too soon, and it doesn't make as good a crop as where the land is higher and the roots have to go farther for water. Yes, I know that
5662 irrigation has been practiced in Colorado, and as to whether that is having an injurious effect upon the farming lands

along the river here (objection), I don't see where it has had any bad effects; and I am stating that from my personal observation of lands along this river, yes, sir. (Objection.)

Cross-examination.

By Mr. ASHBAUGH:

5663 I lived on section 28, 27–21, right on the bank of the river and twenty-eight miles below Dodge City. There are places on that land right near the bank of the river you would strike water at two or three feet. That was not considered good alfalfa land when we went there first. Yes, the second bottom lands appear to be better for alfalfa than the first bottom. It is a little heavier land, too. I thought the first bottoms were too wet for alfalfa. I thought the water came too close to it at times. I don't think it is any better within the last ten years. No, I don't think the first bottom lands are considered good alfalfa lands down there now.

5664 (Objection.) I don't think that there are good alfalfa lands along the river that years ago were not considered good for alfalfa on the first bottoms. At least I don't know of any; that is, on the first bottoms. I don't think any of the best alfalfa lands are on the first bottoms. They are raising some alfalfa on the first bottoms, yes, sir. I don't think there is much difference in the water level down there where I lived. No, sir, I don't think the high water lasts as long as it used to, and the low water lasts longer. Yes, sir, I think the dry spell is longer than it used to be.

5665 1904 was not a very wet year. There were wet times in it, but how many times I have no idea. There was probably more water in the river in 1904 than for a number of years previous; that is, it ran longer. I don't think it ran dry. A number of floods came down the river that year, so that the general flow was kept up more than for a number of years previous, and more than in 1903. At the soldiers' home the old wild grass land don't extend over that land that is now in alfalfa. Yes, the general hay lands along the river were grazed off in the earlier years. I don't know as it would be fair to compare an early crop when it was grazed off with the later years when it was not grazed; still, judging the same kind of land that was not grazed—there was land that the stock

5666 was kept off of. Yes, the prairie fires burned it off very often in the earlier years, and that wasn't any benefit to it. As to whether the land becomes saturated back from the river to a higher level when the high water stays in the river than when the water has been low in the river, I will say it does when the river stays up any length of time—if it stays up quite a while. During the earlier years I think the river stayed up somewhat longer than during the last ten or fifteen years prior to 1904.

As to the tendency of high water in the river to saturate the land back to a higher level in those earlier days than later (objection), I will say there would be evidence of that on the first bottom

on the surface, but on the second bottom you would not notice
5667 it any. As to the water level under the first bottom lands for the last ten or fifteen years prior to 1904 in comparison to what it was prior to 1890, I will say it would probably average a little lower, yes, sir. I think it would average a little nearer the surface throughout the year during those early years. (Objection.) It has not been my experience that the first bottom lands in those early years that were too wet for alfalfa have become better bottom lands in the later years by reason of the water level going down. The fact of the water coming up at times is what has injured the alfalfa on those first bottom lands. When it came up and stayed up long—the alfalfa has not done as well on those bottom lands next to the river as on the second bottoms. I attribute it to the fact that the water level was too near the surface. The water must be
5668 within a reasonable distance of the surface to make good alfalfa lands, and if the water level should come within a few inches of the surface it wouldn't be good alfalfa land. Since about 1890 the period of low water has been longer than during the earlier years, but I think the flow of late years has been as certain or more certain than it was before, although it was not as large a body.
5669 I don't think the climate has increased in dryness of late years. (Objection.) I think there has been less water in the river for a longer period, but it has not gone totally dry any more than it did in the earlier days. I couldn't answer the question as to how many years during the last ten years the river has been actually dry at Dodge City. I don't think it has been totally dry in
5670 the last ten years at Dodge City. It has been dry at Dodge City within the last ten years when the water was not running—I don't know what year it was—but there was always water in holes somewhere. There was a time when I noticed there was no flowing water. No, I don't say that for the last ten years there has been flowing water in the river past Dodge City all the time. That wouldn't be true. There have been times in the last ten years at Dodge when there was no flowing water, but I couldn't say how often. Yes, there was water in the river from August, 1903, to May, 1904, some time during that time, at Dodge City. I don't
5671 know where it came from. I have never seen a winter here but what there was water of some kind in the river, excepting 1879. The water here in the river might come from local rains or it might come down the river. There are frequently places where the water appears to seep into the river from each side. I don't know where it comes from. As to whether any water came down the river from above here, not from local rains, so as to make a flow in the river, from August, 1903, to May, 1904, I couldn't say as to that—where it came from. No, I don't think there is as much water flowing in the river in the last ten years prior to 1904, exclusive of floods, as there was for the ten years prior to that time, and the periods of low water are longer. (Objection.) In 1879,
5672 as I stated, I was along the river for miles and couldn't find any water anywhere. 1879 was the only year in all my

recollection that I ever saw the river totally dry. I don't know just how it was right here at Dodge at that time. I was living down below. I have frequently seen it when there was no flowing water. I mean by its being perfectly dry that there was no water in holes along the river, and the year 1879 was the only year that I saw it in that condition. It possibly may have been dry at other times when I have not seen it. There were other times when there was
no flowing water, yes, sir. There were several years. And
5673 there have been some recent years, within the last ten years,
when there was no flowing water, but I don't remember any year when it was as dry as in 1879. The freshets would last longer in some years than others. They would generally come up some time in June, and there would be water until along in August.
Some years it wouldn't last that long and some years there
5674 would be rise after rise come down and keep it up. No, these freshets don't last as loug in recent years and the water don't stay up as long after a rise. They don't go down any more suddenly than in the early years, but I don't think they last as long as they did.

Redirect examination.

By Mr. GREGG:

No, sir, I never made any special examination as to the water level as it is supposed to come from the river on these lower bottom lands, only—well, as I stated to him, after the river is up a while the indications are that on the first bottom the water comes so close to the surface that it would be much damper than it would be in low water; but I never examined it by digging any wells or making
any investigations of that kind, no, sir.
5675 An alfalfa crop is more valuable than wild hay, and in
alfalfa they often get three crops a year. Yes, sir, lands which were in wild hay and have now been planted to alfalfa are more valuable, if it is good alfalfa land. There have been some good hay lands spoiled by attempting to raise alfalfa on them. Yes, sir, sometimes it is true that they do grow alfalfa where the hay had been grown, and where that grows it is then more valuable than when it was in hay lands.

Redirect examination continued.

By Mr. DAWSON:

Yes, sir, I meant to say that the low water flow continued more regularly or kept up some flow more permanently in later years
than it did in the earlier ones. It is my idea that the flow
5676 of the river has been equalized or is more regular than it
formerly was; not so high for so long nor dry for so long, but running a moderate amount of water more steadily. Yes, sir, that is what I meant.

Recross-examination.

By Mr. ASHBAUGH:

No, sir, I didn't say that the periods when there was more water in the river were less frequent than they were in the early years. The impression I wished to convey was that the river would not stay up as long as it used to, but there was a more constant flow of water throughout the season, yes, sir, in the dry season, and although it may not have been as large a body of water, there has been something of a stream running of late years more than there was—— Yes,
I think there has been a more constant flow during August,
5677 September, October and November during the ten years prior to 1904 than there had been during the same months in the earlier years. (Objection.) I think the water has been lower during that time, on an average, but it has not been—the stream has not been cut off entirely, as much.

5679 CHARLES E. ARGABRIGHT, Dodge City, Kansas.

Direct examination.

By Mr. GREGG:

I am forty-one years of age and am engaged in the grocery business and live in Dodge City, Kansas, and have lived here about eight or nine years. Before coming here I lived in the eastern part of Ford county, near Bucklin, about twelve miles. I lived on the river. Bucklin is about seven miles south of the river, and the place where I lived is about twenty-five miles from Dodge City. I
began farming there. Yes, sir, the farm was on the river. No,
5680 it doesn't border on the river. When I first came there I located on the upland about three miles back, and I was there two or three years, and then I moved down onto the river bottom and I lived on the river bottom about ten years. I came to Ford county in 1885 and remained on that land in that vicinity about fifteen years. I was on the bottom land about ten years.

There was a pretty good flow of water in the Arkansas river in 1885. I didn't live right on the river but was there frequently and crossed the river. In 1886 there was a pretty good flow, and then in 1887 it was less, I think. In 1888 or 1889 the river in one of those years went entirely dry and there was no water flowing at all. The flow in certain years after that was greater and at other times less, just as the season was—well, if we had an extremely wet season it would be wet every place and there would seem to be more water
in the rivers in those times than in extremely dry years. In
5681 an extremely dry year the river would also go dry. The general rule in the fall of the year was that the river was generally low—sometimes entirely dry. Yes, it occurred quite often that the water got very low in the fall of the year. It was not an unusual occurrence.

As to the flow of the water for the last three years as compared with those earlier years, I think the flow of the last three years has been a little greater than it was in the earlier years. It averaged better, taking the years through, than in the years preceding.

Yes, I talked with people in the place where I was then living on the Arkansas river as to what its conditions were in former years. (Objection.) Some old residents when I first came out here told me
5682 that in times past the river had been entirely dry in previous years, before I came here. In regard to anything happening to particularly impress that upon my mind (objection), I would say it seemed to me, owing to the stage of water in the river at that time, that it had been dry in the previous years. There was considerable water in the river in 1885. Yes, sir, they cut hay near the river down there, and I saw those lands after the time I lived there, from time to time. Yes, and I cut hay off those lands a good many different years, and I have seen the same lands within the last few years. As to the amount of grass that grew in those earlier days as compared with that in subsequent years and at the present time, (objection), I would say I can't notice
5683 much difference in the growth of grass near the river. The only difference is that it seems to extend farther back from the river, this blue-stem. In fact it seems to be all over the country more than it was in the early days.

Well, it is a pretty hard matter to determine how much hay those grass lands in the early days would produce per acre, but I think so far as the quantity is concerned that we raised in the earlier times that it was about the same as at present. I can't say that I notice any difference.

As to alfalfa land, I have cut alfalfa down there, yes, sir, and as to
5684 the comparison between the earlier and the later years, I think the conditions are just about the same now as they were in former times. And I think as good crops are raised there now as in those earlier days, yes, sir.

I am well acquainted with the bottom lands and the second bottom lands that border on the Arkansas river east of Dodge City, but am not so well acquainted with the land west. I have been west and I have some knowledge of that land too, but am more particularly acquainted with the land east, and I think that the production per acre in the earlier years as compared with subsequent years and up to the present time is about the same. I guess there is a difference in different years, owing to the season, but barring drouths and grasshoppers, and speaking now on an average, I don't notice any material difference.

5685 Yes, there is a great deal more alfalfa raised now than ever before, because there is a greater acreage now. (Objection.) They ordinarily produce three to four crops of alfalfa here per year, and usually when the grass lands are changed to alfalfa lands it makes them more valuable and they derive a greater income from

alfalfa land than from the grass lands as a rule, that is, from land that is adapted to alfalfa—river bottom lands.

The value of lands at the present time is greater than it was in the earlier years. There have been times since I first came here when the value was less, but it has been increasing the last few years, and the value is higher now than it has been at any time since I have known these lands. Yes, there was one time during the boom when it reached about the same height as at the present time. (Objection.) I don't remember at any time since I first came here when the values were any higher than they were when
5686 I came here in 1885 until the present time. Yes, sir, so far as my knowledge extends the values are higher now than they have ever been before, and that takes in bottom lands, second bottom lands and the uplands. All values are higher now than they have ever been since I have been in the country. The value of alfalfa bottom lands along the river in the vicinity of Dodge City runs from $50 to $100 an acre where it is well set in alfalfa. I am not so well acquainted with the value on the second bottom, but I think they are asking from about $25 to $40 an acre for it.

The grass lands on the first bottom near the river—well, it is pretty hard to distinguish between the grass land and the alfalfa land, there is so very little of it that is grass land that is not alfalfa land.

As to whether I have ever heard any complaint from any of the farmers or among the people where I was down there in that part of the country to the effect that the crops or what was growing on the land was being badly affected by the lowering of the water level, I would say, no, sir, I never heard any complaint.

5687 Yes, sir, I am engaged in the grocery business, and in that business I come in contact with a great many people and with farmers in this vicinity, and in a general way I have had conversations with them in reference to their lands, etc. Not particularly. No, sir, I never heard any of them suggest anything of that kind—that the lands were badly affected because the water level was lower—nor have I heard it from any other source.

If it be the purpose of the present suit on the part of Kansas to prevent anyone from taking water from the Arkansas river for irrigation either in Kansas or Colorado, as to whether the establishment of such a doctrine as that would be of advantage or would be a detriment to the citizens of this county (objection), I would say I
5688 think it would be a disadvantage. And as one of the citizens of the State of Kansas, interested in the welfare of this community and county, as to whether I would be in favor of the establishment of a doctrine which should prevent the taking of water from the river for irrigation (objection), I would say I would not be in favor of it.

Cross-examination.

By Mr. ASHBAUGH:

5689 If the purposes of this suit should be to gain more water and a greater supply of water for the flow of the Arkansas river through Ford county and to supply the ditches already dug in Ford county for irrigation (objection), then I should answer that if that result could be brought about I would be in favor of anything of that kind. I think it would be better for the country if there was more water here at all time. It would make general canditions better. It would indicate a more humid atmosphere if there was a larger supply of water coming from some place than there had been in the past. If the river should be higher
5690 than it was from 1890 to 1893, and a more permanent flow, I presume it would be of benefit to our bottom lands in this county to a certain extent. Anything that brings more water into the country, I think, benefits the land in that country. I don't know of any particular piece of land that would be more productive; I was testifying in regard to general conditions.

5691 As to the crops last year on the bottom lands in Ford county, I don't think the crops were very heavy last year. I was not out through the country much last year, but I don't think they had very heavy crops, except alfalfa, which I think was just as heavy as it has ever been.

I have been in the grocery business about five years.

I don't think there is much difference in the alfalfa crop one year with another on the bottom lands. I should say I don't think there is much difference, if any. I haven't been able to discover any. In some wet seasons we have greater crops than in dry seasons. In some seasons they are almost entire failures because there is not enough rainfall. Certainly it is true that our poorest crops in this county are in our driest years; and we are troubled in Ford county with drouth. If we could have more water in Ford county, our land would be more productive, if we could get this water onto the land. As to how the river affects the local showers (ob-
5692 jection), I have not noticed any difference as far as that is concerned. No, I have not noticed that we have more local showers here after the river has been up than at other times, and never heard of that. I may have heard of it. I was speak-
5693 from my general observations. No, rains here don't affect the flow of the river much. I have known of rains that didn't extend very far west or were not reported very far west that would make water in the river for a few days. The main flow of the river comes, I presume, from the mountains west of us. Yes, the river is high today and has been for a week. It didn't come from local showers here; it has come from heavy rains west of us and the melting snows, I presume, all the way from here west. I think there was a local shower here Sunday week, clear west. That was the report anyhow. I was not out there.

My information was that there was a very heavy rain from here clear west into Colorado, and I suppose the whole thing affected the flow of the water in the river. My observation in the past has been that the river has had more water in it when we have had
5694 wet seasons here, and of course crops of all kinds are better every place, not only on the river bottoms but on the uplands as well. No, my impression is that the early part of the season of 1904 was pretty dry. I couldn't say whether during 1904 the river was higher for a longer period or not than for any previous year for fifteen years. I think there was more heavy rains in Colorado and New Mexico at different times in the summer of 1904. Yes, there were a number of periods of high water in the river in this county in 1904. I presume that our bottom lands are more productive when the river is in the condition it was in during the greater portion of the year 1904 than during a year when the river is very low. Yes, I think it would be for the benefit of the bottom lands of Ford county to have a greater supply of water than
5695 we had in the river for the last ten years prior to 1904. The lands would be more productive and more valuable. As to my having stated something about the river being high for the last three years, I don't think I stated that the river had been high for the last three years. I think it has had more water in it than it had at previous times. I think that is the way I answered the question. I don't remember the condition of the river in 1903 right through. I just answered in a general way for the last two or three years, and what I had in mind was the condition of the river during the year 1904 and thus far in 1905.

5696 As to the effect of the rising of the water in the river upon the water level under the first bottom lands, I will say I am not able to answer that question. I never noticed any effect. When I was on the bottom it was what was called second bottom. It was about seven feet to water down near the river where I was. It was only two or three feet to water in some places. I didn't notice any difference when I was living there. I have not noticed how the water level has been under that land for the last seven or eight years, but previous to that time I didn't notice any difference. When the river was entirely dry I didn't notice any difference there between times of that kind and when the river was bank full. I only noticed that we could go any place on the farm and drive a point down seven or eight feet and get water. My observation is that where it is seven or eight feet to water it is better alfalfa land than down near the river, and I presume the reason is because of the fact that the water is not so close to the roots of the alfalfa and it doesn't make such a rank growth, but I notice it doesn't produce so much down near the river where the water is so close to the surface
5697 as farther back. I think that is a general fact well known in this valley. When the water is so near it depends somewhat on the character of the soil, and I presume that has something to do

with it. There are lands fifteen or twenty feet to water that seem to produce as good alfalfa as there is in the country. I believe the land where it is fifteen feet to water is as good alfalfa land as where it is seven feet to water. I have observed pieces that are just as good for a series of years. There is some east of town here that seems to produce just as good. Where the water level is fifteen feet below the surface I presume the roots go to the water, and I should think where the roots go fifteen feet to
5698 water they will furnish as good and rank and permanent a stock as one that goes seven feet. I don't think it can go to the depth of thirty feet. Trees work on the same principle. I don't say all kinds of land would do that; I say I have observed
5700 pieces. From my observation I think that the depth to water has something to do with the productiveness of land in a crop of alfalfa.

Yes, sir, there was a good flow of water in the river in 1885, and I think a pretty fair flow in 1886, and a pretty good flow in 1887, but not a good flow in 1888, and part of the year 1889 it was dry. I remember 1888 and 1889 because I was interested in an irrigating ditch at that time that we were building in the east end of the county, and I know that in 1889 the river went dry and we
5701 couldn't get water into our ditch. That ditch was a coöperative ditch. We took it out under the State law. I think we called it the Pleasant Valley Cooperative Ditch Association. We took out a charter under the State law. I think that ditch was dug about ten miles from where we tapped the river to where we quit work. We began in 1888. We didn't have an apprehension of a failure of the water in the river to supply that ditch. It was our idea that there would be water enough in the river to supply it. I don't remember how the flow of the river was in 1891. We abandoned the ditch and didn't pay any more attention to it, and I didn't have anything to impress it upon my memory as to any particular year after
5702 that. We abandoned that ditch simply because we couldn't get water in it in those years I spoke of, because the river went dry and those who took stock in it or were members of the Cooperative Association lost interest and failed to keep up their assessments. They lost interest in it because we couldn't get water in the ditch because the river was dry. This was in 1889. That ditch has never been opened since. I think there have been years since then when there has been a continuous flow of water the year round. I couldn't say as to what years. I couldn't say now how many times the river has been dry for the last ten or fifteen years; I don't believe there is a man here that can. As to the river having been dry for a greater number of years from 1890 down to 1903 than during the same number of years prior to 1890 (objection), I will say
5703 I was not here as many years before 1890. I think the average flow for the five years following 1890 was about the same as for the five years prior to 1890. Yes, in 1889 we lost interest and abandoned the work on the ditch and nobody took hold of the proj-

ect, and that was the reason they didn't keep the ditch up for the five years after. I presume they were afraid it would be a repetition of what had occurred before. It was quite an expense to operate it. Yes, during the years 1890, 1891, 1892 and 1893 there would have been water enough in the river to make that ditch a success. I don't know whether there was a continuous flow all those years, but there was water enough, I think, to have made the ditch a success at all times. There might have been periods when the river was dry during that time. I can't say now. I don't remember. But there was enough water to make the ditch a success. Yes, I
5704 think they abandoned that ditch simply because there was a dry time in one particular year, and the fact remains that they didn't resume operation the next year. That is all I know. Yes, sir, I know other ditches in the county—the Soule ditch north of town here. I don't remember how long it ran. I was living on the river and was not in contact or near that ditch and don't know anything about it. I think that ditch runs about sixteen miles north of where I was living. (Objection.) Yes, I have known of the water in the Soule ditch below
5705 Dodge City. (Objection.) I don't remember the year. I remember being at Spearville and seeing water in the ditch at one time anyhow. I think that ditch has been abandoned since that time, but I don't know why. Yes, I think there has been water enough in the river for the last ten years to fill the ditch—to make it a success. I think so. (Objection.) Not,
5706 however, to supply it all times, but I think enough to make it profitable and to supply the whole length of it. Of course I don't know exactly how long it was, but I think it was about fifty miles long. I don't know whether the river has been dry at any time between 1895 and 1900 or not. I think there was a pretty good flow of water. I don't remember whether I have seen it dry during those years. Yes, I have frequently seen water in it at various times. All seasons of the year. It may have been dry, too, at some seasons of the year. I don't know. It probably was.
5707 I don't know why they are not operating the Eureka ditch now. (Objection.) No, I never heard that they had not operated the ditch because there wasn't water enough to operate it. I never heard very much about it, in fact. Yes, if there was water enough in the river now so that that ditch could be operated it would be an advantage to the citizens of Ford county. They were working on that ditch in 1885, I think. (Objection.) As to
5708 the value of land being greater now than it used to be, they seem to be getting better crops the last year or so. One thing that is making it increase faster the last year than any other time is, I presume, the precipitation. Land values seem to be going up all over the country. These things occur at different periods—depressions and rises in land values. I don't think there is much difference in the farming in this county now from what it was twenty years ago, as far as that is concerned. I presume they have better

machinery; this is a progressive world. I saw just as good
5709 crops then as I have seen of late years. The class of people that were here when I came first didn't come with the idea of staying and making homes and didn't attempt to farm as the people are farming at the present time. The class of people that are here now are expecting to stay here and make homes for themselves, and I presume are doing better farming anyhow and raise better crops, and better crops make land more valuable

I don't know what the population of Dodge City was when I came here. They claimed they had three or four thousand.

As to the banks of the river, I can't notice any particular difference as to the widths. (Objection.) The trees that I see by
5710 looking out of the window here make quite a forest. There are more trees along the river now. I don't know about these particular trees here, whether they were planted at that time or not, but there are trees all along the river where there were not any in 1885 when I came here. No, there were not many trees along the river in 1885. I presume the prairie fires tended to destroy them up to that time, and the cattle destroyed some of them. No, sir, I was not in Dodge City when there was a bridge over the north side of the river over onto an island. I may have been in Dodge City but never crossed that bridge and don't know
5711 whether it existed at that time or not. If there was more water in the river, and especially during the dry season, I don't think it would affect any land only that which is right directly on the river bank. It might produce a little better grass; but I don't think it would make any difference as far as the upland is concerned. I don't think it would make any difference as far back as I lived from the river.

I said once before I couldn't notice any difference in the underflow in digging a well back where I was. It was six or seven feet to the water, one year with another. They call it an underflow, but I don't know whether it is an underflow or not. I mean the sheet of water that we strike all along the river bottom. That seems to be the general term here for it, but I don't know whether it has
5712 any current at all or not. I suppose it comes with the river and falls with the land. I know in digging a well there the water comes in all around. It doesn't come in veins like on the upland in a good many places. You dig down until you strike quicksand and the water seems to rush in from all sides. I couldn't notice any difference where I lived—that the underflow was higher after the river had been up than it was after the river had been down for a long time. No, I never noticed it, but I am satisfied it would be, near the river. Of course it would percolate or seep back for that distance.

Redirect examination.

By Mr. GREGG:

Yes, there is more alfalfa along the river in this county now than ever before. As to other crops, I don't know. Oh, yes, there is more land from which general crops are being produced than ever before in its history, of one kind and another. No, I didn't mean to
5713 state that the crops generally through here would be more productive because there was more water flowing in the river.

The several wells or points that I sank upon my land at various times run through a period of about ten years. I lived that length of time on that place, and I didn't notice any difference in the rise or fall of the water level in driving those wells during those years. Not at the place I lived. This was back from the river. But near the river or back or close to the river, I suppose it made a difference. No, I have no knowledge of that fact; it is a supposition and hearsay on my part.

Cross-examination.

By Mr. CAMPBELL:

Yes, sir, I testified that I lived about three miles from the river. There is a pretty wide bottom there. It is right in the bend of the river. I also said in answer to a question put to me by coun-
5714 sel for the State of Colorado that I had never heard that the falling of the water level in the river bottom here had injuriously affected the crops, and I now say that I never heard prior to the institution of this suit that the water level in the river bottom here had fallen. Not that I remember of. Yes, sir, I have lived for twenty years here and mingled with the people around the river bottom ever since I have been here.

I am a partner of Mr. John W. Sidlow, who testified in this case this forenoon.

5715 WILLIAM J. SPENCER, Dodge City, Kansas.

Direct examination.

By Mr. GREGG:

I am sixty-five years of age, and live at the soldiers' home, Fort Dodge, in Ford county, and have been there ten years in the capacity of quartermaster sergeant. No, sir, I have been in the capacity of quartermaster sergeant for the last seven years. I first came upon the Arkansas river in Kansas in the spring of 1863. I came from Fort Lyon in Colorado. I hardly know where I was going. We were striking east. I belonged to the Second Colorado infantry at that time and we came down the Arkansas

river from Fort Lyon. We left the river at Cottonwood, Kan-
5716 sas, I think, and didn't strike the river again until we went to Fort Scott, and from there we went down to Fort Gibson and struck the Arkansas river at Fort Gibson. Yes, I was soldiering at that time. I was next on the Arkansas river at Webber's Falls. It lies in between Fort Gibson and Fort Smith. No, sir, we didn't come up the river that year; we went to Fort Smith and from Fort Smith to Van Buren. That is about five or six miles down the river, I believe, from Fort Smith. We next struck the river in Kansas at Fort Zarah, at the Bend. It is what they call the Bend of the Arkansas now—that is, Great Bend. Well, we were four miles east of there. That was on Walnut creek. That
5717 was in 1865, in the winter. We remained on the Arkansas river then until June, 1865.

The flow of the Arkansas river at that time in May was—it was pretty full. It was just about the same as it is now. Oh, yes, I saw it when it was low or dry. There would be a rise something similar to what there is now. That was along in that same year, shortly after, that the river went down. I don't know that the river went quite dry. It was so you could cross it easily. (Objection.) I don't know that it went quite dry. No trouble to cross it. There was a small amount of water in the stream. In May, 1865, was about the only time there was a flow of water so that you couldn't cross the Arkansas river any way—with a wagon or any way else.

5718 I next saw the river in 1866. I crossed the Dry Bone on the Dry Bone route from Fort Union and crossed the Arkansas river a little above where Cimarron is now, and the condition of the water in the river was about probably knee deep in places; at the deepest places it was about knee deep; and the stream was not very wide.

I was next upon the Arkansas river in 1867, also in 1868, 1869 and 1870, up to the present time. As to the condition of the river during those years, I would say about along in June and July we would have quite a flow of water in the river, and along in the winter season in the fall of the year she would be partly dry. Yes, that occurred quite often at that season of the year. We thought it was a regular thing. Yes, sir, during the time that I have men-
5719 tioned I saw it dry. It was dry, I think, somewhere between 1876 or 1877 and 1880. I am not certain whether it was dry enough so that you couldn't get water enough for any stock; that is, for a little while. Yes, I have seen it dry so that you could step across it without getting wet. Well, there would be a small stream flowing, but so that you could step across. We could work around and step across it. In some places we could get water and in some places we couldn't. At the time I speak of seeing it low between 1877 and 1880 I was working for R. M. Wright & Company, as receiving and shipping clerk for that company. That company was supplying the cattle trail—the cattle men. Yes, along about in

1879, I think, I took supplies to Cimarron. I don't
5720 recollect the year, but it was about that time. The way we happened to take supplies to Cimarron was, they were afraid there wouldn't be any water for their cattle only in the Arkansas river. Cimarron is on the Arkansas river, but I think before we got to cut the supplies out, as the cattle moved up, the rains commenced to fill the country and then we had plenty of water. It began to go down. When I speak of there not being enough water to supply the cattle I refer to the water in the Arkansas river, yes, sir, and we were taking these supplies up to Cimarron because the water was so low in the Arkansas, so low as not to be enough to supply the cattle. Well, I don't remember how long the river was dry at that time. It was not dry very long. As to crossing the river at that time, I would say
5721 along in there they had a bridge here and there and they were not thinking anything about crossing. Oh, yes, they could cross it at most any point. As to it being a common occurrence for the river to get very low, I will say, why, yes, we always looked for a low stage of water in the fall and winter (objection), and when the fall came around, why, we would have low water. Well, as to that being true nearly every year, that is what I have reference to. I don't remember any particular year. As to the flow of the river say from 1885 to 1890 as compared with those earlier years, I would say I didn't notice any difference; and taking the dry season in those earlier years, from 1865 to 1868 and along there and up to the present time in cycles of three to five years at a time, I will say I don't think there is much differ-
5722 ence. As to the last three years and those very early years, I don't know. I have never paid any attention to it. I don't know but what we are getting a little more water now. We may have less after a while. In 1866 we had just about such a flow of water as we have here now. I don't think there was much difference in comparing the whole ten years just now past with the first ten years when I was on the river. We had a big flood in 1895.

Yes, sir, I have been living in this town and vicinity for more than thirty years. I have been living here, you might call it, since 1867, up to the present time. No, I don't know much about the crops at Dodge City and in this vicinity. Oh, yes, I have
5723 seen the lands up and down the river and in those early years they had considerable hay land along the river, but I never assisted in cutting any hay myself, no, sir. Yes, sir, I have seen it cut there, and I saw those hay lands from time to time. As to the amount of hay produced per acre in those days as compared with the present, I would say I couldn't tell you about the alfalfa, but for hay, I think we had a little more hay. (Objection.) There was a little more hay put up by individuals. There were not as many cutting, of course, but what did put up hay put up a larger lot of hay. Yes, sir, I am acquainted with the hay lands at
5724 the Fort Dodge soldier's home, and there is still some of that land in hay, yes, sir, I think about sixty acres, probably.

They are putting a good bit of that land now into alfalfa. Yes, sir, there is something in the neighborhood of sixty acres left now. I could hardly get at the amount of hay per acre as compared with the earlier years. (Objection.) We are putting up more hay now because we have more cattle and horses to feed. Before, of
5725 course we didn't cut all the hay. We didn't cut it down for hay. We just cut what we needed and let the balance go. No, I don't know as I ever noticed any difference in the amount of hay that did grow there. It is just about the same, I think, from one year to another.

As to my having ever heard any complaint at the soldier's home to the effect that the crop of hay on that land had ever been affected by the rise or fall of the water level, I would say that I have
5726 by a rise, yes, sir, but not by a fall. (Objection.) No, sir, I never heard of any injurious effect from the fall of the water level. The water rose and took away our hay stack once. Yes, sir, it got over the land. I never heard it talked that there was any injurious effect to this hay land on account of the fall of the water level, and as to whether or not in the thirty-seven years I have lived here I have ever heard of any lands or crops being injured on the bottom lands or second bottom lands by the fall of the water level (objection), I would say no, sir. What little crops we are using at the soldier's home down there I guess have been just about the same as always. If anything, a little better. The land down
5757 there today is worth more than it was formerly—more than I ever knew of its being worth. Yes, sir, the soldier's home where I am quartermaster now is the soldier's home that belongs to the State and is located five or six miles east of Dodge City and borders on the Arkansas river. That is the same land that was laid out and called Fort Dodge in the 60's.

Cross-examination.

By Mr. ASHBAUGH:

I have been at the soldier's home since 1895, and was there one year before that. My experience is confined to these last ten years, with that one year added. No, sir, I don't pretend to have
5728 had any experience except just during those times. I have owned a piece of land south of the river about a mile and a half. It was second bottom. I owned it about two years. I put a mortgage on it and the other fellow got it. During the two years I owned that I think I raised about the best corn raised in Ford county. I cropped it one year. That is all that I ever
5729 owned in the valley. I never owned any land bordering the river and never cultivated any land in the valley outside of that piece I spoke of. No, sir, I didn't claim I ever had any experience in respect to crops; I was just giving the facts. No, sir, I never had any other experience.

On this quarter section that I preempted I think I sank a well about twenty-four feet. I didn't dig it; I drove it.

Yes, sir, my whole life has been given to other matters than agricultural affairs. No, sir, as to ever having attempted to indicate a knowledge of agricultural pursuits and crops in the Arkansas valley, I don't know a thing about it. As to an irrigating plant down at the soldiers' home, we have a pond there to irrigate the gar-
5730 dens with. That pond is supplied from the underflow, I suppose. I couldn't say whether it is the underflow of the river or not. (Objection.) It is supplied by water that we get from under the surface. That pond is probably three or four hundred yards from the river. The water is gotten into that pond by a pump. I think we went down somewhere from twenty to twenty-five feet.

As to the water level when we first struck water on the land
5731 there, I think it is a little below it. Of course they have to have a good supply of water, and they went down as far as they could without striking the hardpan. I think they went eighteen to twenty feet before they struck water. As to how far you go down before you strike water near the river (objection), you strike water anywhere around there at about eighteen feet. It is all owing to how much soil there is there of course, and what locality it would be in. If it was in the bottom land it wouldn't be very far; if it was second bottom land it would be farther. About fifty feet from the river on the land at the soldiers' home you would go about two feet, I guess, to strike the water level. (Objection.) That would be figuring on where they get that island that is attached there.
5732 They claim it is attached to the land there. It is filled in land. The island has been there for—well, you might say it is the mainland now, but it was an island when I first knew it. It is pretty hard to tell how wide the river was south of the island when I first knew it. You couldn't get anywhere near it, of course. Sometimes we would go up the river or down the river to get across, but straight across it might be a quarter of a mile. That is, when I knew it first. From the north side of the island to the north bank of the river, when I knew it first, oh, it was something like a hundred feet. As to that channel now, we haven't got any chan-
5733 nel there now. It went to the south side, I guess. The channel is filed up. That is what I mean by saying that the island is all made land now—that the north channel is filled up now. Yes, that channel has sodded over since. There are some places were they had the river before that, that they are farming it now. They have got it in little gardens. That space is about a hundred feet wide. No, they are not farming that island now; there is timber on it. It had a little scattering timber before. Since the soldiers' home has gotten in there the timber has grown.
5734 Yes, the river is very high just now and has been for a week or two, and it flows over the whole of that island. Yes, when the river is dry this island is larger now than at similarly dry times in early years. It is accumulating land there all the time. No, the

river is not as wide now as when I knew it first, when you get on the south side of the island, (objection). No, when the river
5735 is at its normal stage there is no water on the north side of the river, and at its normal stage the channel there is probably narrower now than it was then. (Objection.) And where the river is receding and getting narrower trees have grown within the last fifteen years. Yes, there was an island in the river right
5736 here at Dodge City in those early days called Walker's island. I remember the store having been kept on that island. It was kept by Johnny Gibbs and R. M. Wright. It was Wright's store. Yes, there was a bridge across from the north side of the river to that island. It was not much of a bridge; it was a kind of a culvert. It has been filled up there since. I haven't paid
5737 much attention to it. But that was the river, and it was dry enough then so that there was not much water in it and we made a roadway across in there and filled it in there, which is the cause of that island filling up, and they left a culvert to get in through there, and then afterwards they filled that up. There were two little culverts in there and one has been taken out. It was filled in from the river, yes, sir, and the river channel is now confined to the south side of the island, and the north part of the island and the land they filled in is now covered with trees. These trees were planted ten or fifteen years ago.

Yes, I stated that along about 1877, 1878 or 1879 the river went dry. It must be close in there somewhere. Before that time
5738 I have seen it dry frequently. As to common talk in the year 1879 when the river went dry that it had not been dry before for twenty years, well, no, I didn't pay any attention to it if they did talk it. I didn't pay any attention to it. As to that being so remarkable an occurrence that people talked about the river going dry in 1879, I will say, well, yes, because they were driving large herds of cattle up through here and they depended a great deal upon water at that time. It was life and death with them fellows then.

5739 There have been a few trees on the islands as long as I can remember, but there are more trees now than then. They have been growing since about 1876 and gradually increasing in number and gradually extending up and down the river.
5740 Yes, in 1866 there was one time that we couldn't cross the river. It lasted about eight or nine days, and it was along in April. A flood came down the river. As to the river during those early years rising in the spring and lasting for some time, I will say no, I don't know. That is about the only time I thought it ever bothered us in any way in going across. We crossed it at any time before we had these bridges here. You could take a wagon and go across it at any time. As to the river rising every spring higher than it had flowed during the fall and previous winter, I will say, well, no, I haven't it set that way in my head. I have it set that it raised along about June and July. We thought it would

rise every June and July. We had that impression. And those periods of high water might last two or three or four weeks, and sometimes longer. We supposed those floods came from the melting snows in the mountains. That is the way they generally
5741 talked to us, and that was the general understanding. At least one fact was true—that those rises did not come from local rains.

5742 As to the water level back from the river on either side during the dry season of the year being now higher or lower than it used to be in the early days, I will say, well, I will tell you just the way it is. I think the water don't come from the river at all in any of these wells. That is my impression, and I can't get it out of my head. My impression is that the water comes out from the hills, because I know we camped around here before any settlements were made here or anything and when we went to camp and we wanted cool water we would go down to the river and dig a little well there and the water invariably ran in from the north side. We were on the north side. And the water would be cool and clear. As to how the water level in that well compared with the water level in the river, oh, I have never studied that. We would dig until we got water, to get cool water in the summer. As to how the water level in that well that we dug would compare with the level of the water in the river, I will say, well, we supposed, of course, that we were going down to the level of the water to get it. You would always get water. You would get it right now. If you will go down to that water to-day you will see it will come in from the north side. As to how far you go down, I will say just a couple of feet. It will not run in from the river, I bet you. Yes, when you go down to the level of the water in the river you will find water. It will come in from the north side. Now, as to the river having been up a week or two or three weeks before you dig, whether you would find that water at a higher level than though the water had been down low for two or three weeks, I will say, well, I don't know. I haven't given any attention to it at all. No, sir, upon the question of underflow and the level of the water I haven't given sufficient attention to testify to positive facts. On the north side of the river there were springs, but I don't think
5743 there were any springs on the south side of the river. I don't know of any water holes or springs on either side of the river that used to have water in them that are now dry, on the first bottoms. (Objection.) On the divides and along the hills there was water. There were lakes that are now dry, on the uplands, yes, sir. The soldiers' home, that is owned by the State of Kansas, was a part of old Fort Dodge, and since that time the State has bought some more land, so that now that it is larger than the old fort
5744 was. I think they have about 400 acres there now.

As to putting up ice on the ponds on the soldiers' home there, I will say I believe we put up ice from that pond in the garden, and I think they put up ice when they had that irrigating

ditch from the pond there. I was not out there when they were cutting it. I went through the ice house, though. That was in 1891. No, they haven't put up any ice since from that place. I don't know that the soldier's put up ice from the ponds down there. They put it up from the river. I believe they did have a pond up on the — but I never saw them put it up—but I think they did have a pond in there. I think they put it up one year from
5745 a pond. I know where that pond is now. During the winter of 1903–'4 there was no water there that I know of. There has been no water in that pond for the last ten years prior to last year, that I know of. As to there being water in the river in the winter of 1903–'4, I don't know. I didn't go down there. I think there was water there. I think the children were down there skating on that pond we were talking about, a year ago. I don't know how it was in the fall of 1902 and 1903. I am not sure there was water in that pond a year ago last winter, but the thing that impressed me was that the children were down there skating
5746 on it. It might have been last winter or the winter before.

Redirect examination.

By Mr. GREGG:

That pond of which we are speaking is a kind of slough. It is located west or southwest of the home, on the low lands, and the water from the hills that comes from local rains fills it up from the surface drainage, and when there is considerable rain some water runs in there and fills that pond, yes, sir. Now, they were talking about digging a ditch there for drainage on account of ma-
5747 laria. The additional land that the State bought for the soldiers' home is located on the north side of it and is higher land—what they call uplands. That which borders on the bank of the river is the same as at Fort Dodge.

I was with the party that did locate old Fort Dodge, that is, I was with Colonel Ford when we came up with a scouting outfit, and we left our wagons there and then went north on an Indian trail over toward Fort Hayes, so that a part of the land that is there now in the soldiers' home includes that contained in old Fort Dodge located in the early times.

I think the climate is changing a good deal in later years because we tried for a long time, the regular soldiers there, to raise trees and couldn't raise any until 1876.

I have gone across the plains a great many times and have never seen many prairie fires. You see the Indians were very careful in putting out a fire and not letting the fire get away from them, and so were the old-time freighters very careful. Yes, sir, most
5748 of the timber in those early days was found on the bottoms. Within the last ten or fifteen years the timber is found not only on the islands but along the banks, yes, sir.

Cross-examination.

By Mr. CAMPBELL:

No, sir, it is not unusual for the Arkansas river to change its channel. I have observed ever since I have been acquainted with the Arkansas river that it changes its banks frequently. It narrows up in places and widens out in others.

5749 I don't know how many wells we sunk on the north side of the river. Wherever we would go into camp we would dig wells to get clear and cool water. Yes, sir, I said that in my judgment the water does not come from the river, because of the fact that I observed that it seeped in from the north side and not from the river side.

Examination by the COMMISSIONER:

Yes, sir, I said a moment ago that when the soldiers were stationed at Fort Dodge in the early days they tried to grow trees and couldn't. I don't know why that was. They couldn't make any success of it. I don't know why it was, but they tried to grow garden truck and everything else that year and didn't make a success of it. They planted trees around there and put little wooden spouts down so that they could water them, and they had a water wagon come around about three or four o'clock to give the roots moisture, and they didn't make a success of it until they planted the trees there in 1876. That was on the same ground, yes sir. We gave them

5750 moisture, too. We would put a half bucket of water or so down in the spout at the tree. I left there after they got the trees started. No, they don't irrigate them now. They will spring up pretty nearly anywhere now, wherever the seeds take root. They are springing up all over.

Redirect examination.

By Mr. GREGG:

These trees are growing back from the banks of the stream on the soldiers' home land maybe 800 yards, and they are growing all right, yes sir, but they are irrigating them, though. Some of them that have them around their houses keep water on them until they are a certain size. Yes, I mean they are irrigating them up

5751 where the houses are built, where they are trying to grow trees around the houses. No, they didn't irrigate the large trees below the houses and on down to the river, and they are growing all right, yes, sir, and have been for the last fifteen years.

5752 H. JUNEAU, Dodge City, Kansas.

Direct examination.

By Mr. DAWSON:

I live at Dodge City, and have lived here since some time in September, 1885, and I first became acquainted with the Arkansas river in Kansas in 1876 at Wichita, about the middle of August. In August, September and October of 1876 the middle of the river was dry. There were two little streams on both sides that you could step over. It was not over a foot deep at any place. There was quite a gully on each side right at the west bridge.

Yes, during the summer and fall I had occasion to come up the river several times, but not very far up. There was running
5753 water on each side of the channel, but the middle of the river was dry where I saw it that fall and summer. The middle of the river seemed to be higher, and it was flowing some streams like we have it here—little streams, perhaps fifteen or twenty feet wide and a foot or so in depth.

The last time I was in Wichita was at the time of the dedication of the temple about five years ago. In 1900 I was there at three or four definite times. That is to say, I lived in Wichita and had a lumber yard there until 1881. I had a lumber yard right where the Manhattan hotel is in Wichita. I used to own the fifty feet west of it. After I left there in 1881 I was back there occasionally up to 1900. I was there, I think, four definite times. I
5754 think there has been a difference in the width of the stream of the river in the city of Wichita between the time I first saw it in 1876 and when I last saw it, made by artificial means. Right west of Douglas Ave. there was a very low place where, when the water was high, the water used to come up there, and I noticed they have filled up quite considerably, more particularly on the north side of Douglas Ave. next to the bridge. Yes, sir, the stream shows evidence of having been narrowed up by filling. As to my having seen the river at any time in the State of Kansas when it was dry after 1876 so far as the flowing stream was concerned, I would say yes, sir, I have. Every time I saw the Arkansas river and observed it during the months of August, September and October, usually there was very little water in it. There is no flowing stream except on the sides. There is always water running on the sides, and it is a fact here too. There will be no water in the middle of the river, but a little stream on the side, following the embankment. No, not a little stream that you could step over, but perhaps twenty-five or thirty feet in width and from a foot or such a matter in depth.

5755 I have been in Dodge City since 1885, and have been engaged in the lumber and hardware business during all of that time, and am still engaged in that business and have a large

lumber yard here. There is only one other yard here, and I have been steadily engaged in this business since 1877, and here since 1885. Yes, sir, the ground where my yard is is owned by myself. My business has brought me into dealing with the farmers throughout Ford county and a portion of the adjoining counties
5756 pretty much, yes, sir.

As to the prosperity of Ford county and the production of crops in the last five years as compared with the first five years I knew it, I would say that with the exception of the last year we have raised a good crop here right along. A good wheat crop right along. Last year it was a failure in the western half or third of the State. As to their crops, there was nothing last year that did, you might say, very well. Fruit did very well and trees growed very fast, and there seemed to be enough moisture underneath, but for anything like cereals, it was too dry, and the occasion of short crops was dryness, lack of rainfall, yes, sir, that is to say lack of rain in the winter and the fall of the year before. Our rain didn't commence here last year until about toward the very last of April, and May, but the crop was too far forward, the wheat crop, and oats, so that—well, it was winter-killed by drouth, that is what is was—largely so. The shortage of crops last year applied generally to various classes of land, the bottom lands and uplands, to
5757 everything except the alfalfa. The alfalfa did very well in the bottom. Yes, as a matter of fact while we had a shortage of rain last year as well as a shortage of crops the river ran rather a better stream during 1904 than it has in many other years. After the middle of May we had ample water in the river, and we had ample rain after the middle of May, but it was too late for our crops. Our crops were winter-killed. That is the way it is. Excluding any one year, as to the productiveness of first bottom lands in this locality now as compared with the country when I first knew it, I would say I think it is a better average, and I draw my conclusion from the observation of the country, yes, sir. Now, the country was practically depopulated, you know, in 1888, by reason of the tremendous drouth and hot winds, and the failure last year wasn't anywhere near what it was in 1888.

As to the prices of land, it is safe to say that the values are not less than fifty per cent. more now than what—— No, sir, the lands in this locality, including all classes—bottom lands and uplands—never have been any more valuable, on an average, than they are now.

No, sir, before the commencement of this suit I never heard any complaint from the farmers with whom I dealt that the general water level of the country had been lowered. I never heard any complaint of that kind.

5758 As to my having had occasion to observe anywhere on the first bottoms in this vicinity the water level so as to state how that level compares this year with what it was say fifteen or twenty years ago, I will say that I have had good opportunity to observe that,

because this well here was the first thing I put in; that is, the well in front of my office, right here, yes, sir, and we dug down about six feet and we got to the point where the earth was sticky and then we drove from there. The object in driving down there and forming this tube was to put in an anti-frost pump, and we dug down six feet so as to get the cement below the frost line. It made an open well for that distance, yes, sir, and it was up to the top of the level of this underflow at that time. And to my observation, the level of the ground water for the last two or three years is precisely the same as it was when I first sank that well, and that will be twenty years next September. No, this well is not on what is known as first bottom land. This is really second bottom land. The first bottom would be behind that fence. I should think that it
5759 is about two to three feet above the first bottom. This well is about 700 to 800 feet from the river. Yes, sir, during this period of twenty years that this well has been down I have had occasion to look into it from time to time, and taking it by periods of years, one year with another, I haven't noticed any general lowering of the water level or rising of it. Of course when the river is high then this level rises, you understand. I expect now in that hole there is perhaps a foot and a half of water. That has risen from the bottom, because the tubing is brick and Portland cement. It doesn't come from the surface at all. As to whether that rise comes directly from the river or whether when the river is high it simply backs up the ground water that is gathered from the plains on the north and is moving to the river, I would say of course, with me, not knowing anything otherwise, I take it that it comes from the river. I would take, of course the idea of the ground water coming in from the river. I think both of them help. No, I have never conducted any special investigations for the purpose of determining the real source of the water in that well, only
5760 the water is there, that is all. Even though this water may rise and fall a little as the river and conditions change, yet, one year with another, the well maintains as good a level today as when I put it down, yes, sir. I wish to state there, when you speak of the well, that that is simply an opening to the well. The well is twenty-five feet deep. I go to the second water. And I wish to say also that this water here was analyzed by the railroad company before they put in their immense well system here, and the analysis that this showed was that this water here was good for steam; that is, this second water here. Now, then, the analysis at my well over there (on same property) they said was not good for steam. No, sir, the river water itself is not good for steam, because that is treated. The second well I spoke of as not being good for steam is about 200 feet closer to the river than the other one and about 500 feet from the river, yes, sir. They are very nearly on a line. This one
5761 is right here and the other one is about twenty-five to thirty feet to the east. They only lack some twenty-five or thirty feet of being on a line north and south, running at right angles

with the river. The Santa Fe wells I spoke of I should say are about the same distance from the river, and that is about 700 or 800 feet from the river, and about the same distance as my well which is good for steam purposes. Now, another feature is that they were never able to find water where they are that is good for steam. Where the Santa Fe wells are now they have got to treat their water, although they bored one well, I think, as low down as ninety feet. They have spent an immense amount of money to get that same water I have here. That is one of the peculiarities of this well here that is not fed from the river. This must come from some spring above here. This well analyzes just the same as the spring they have at Duck creek, four or five miles north of here, and this spring is north and west from here.

5762 The slope of the country is from the north to the river and from the west to the east.

Yes, sir, I came here in 1876, and as to the flow of the river in recent years compared with the flow in the earlier years, taking it over a period of enough years to make allowance for any peculiar conditions, I would say, for instance in 1877 I had a shop on the land adjoining the Manhattan hotel in Wichita. My shop was about two feet high from the ground and the water came in and covered the floor of my shop about six inches. That was in May, 1877. The following September the river was dry. That shows the two extremes in one year, you understand. I should think that the flow now is more even, if anything, than what it was in the earlier years, but in the earlier years we were more liable to floods and violent extremes, both in storms and in the rise of the

5763 river. But taking it as a river for practical purposes at this point, in my judgment it is as good a river now as it was when I first knew it. I believe it is.

As to my having heard any complaint in my dealings with the farmers of this county and locality before the commencement of this suit that their land was lessening in value or production by reason of the lowering of the ground water or the failure of the flow in the river, I would say I never heard a complaint of that kind.

Cross-examination.

By Mr. ASHBAUGH:

I came to Wichita in 1876 and was there during the flood of 1877. The origin of that flood was a series of storms west of us, heavy rain all along the river, as near as I can remember. We got a telegram, too, from the west at that time about the flood coming down. It was both local and also from the west. My recollection is that it extended up farther than Hutchinson, Great Bend or Larned.

5764 I think that was in May, 1877. I was not in Wichita so as to compare the flood of May, 1877, with the flood of July, 1904, and have not been in Wichita since the latter flood. Yes, sir, the water ran across Douglas Ave, at the Manhattan hotel in

Wichita in the flood of 1877. It was a great stream there. I know that nobody could cross it for a day at least. I think the flood at Douglas Ave. near the Manhattan hotel was more than two feet deep in places. I understood that flood originated all along the
5765 river, perhaps from melting snows and rains. Yes, the Little river was up high, because the Arkansas river was so high that the Little river backed in—it broke through the Little river about a quarter of a mile or a mile above the bridge on 13th street, and came through diagonally past the old Occidental hotel, and then diagonally again to where the Manhattan hotel is now. At that time there was a wooden bridge across the Arkansas river, built on piling, I think just about wide enough for two wagons to
5766 pass. I couldn't tell how long it was. I never counted the spans.

Examining Complainant's Exhibit A–1, I will say I do not recognize it. This is a truss bridge. I don't think that bridge was there at that time. No, sir, I don't remember that bridge at all. I don't remember them trusses. They have a truss bridge here (in Exhibit A–1). Yes, sir, I have crossed the old wooden bridge at Douglas Ave. in Wichita a number of times. I don't know when it was taken down. I think when I left there in 1881 the old bridge was there yet. My recollection is that it was a pile bridge, a good deal such a bridge as we have here (at Dodge City), just on piling.

Examining Complainant's Exhibit A–2, I don't recognize that bridge at all.

Yes, I was at Wichita in 1878. I don't remember the directory of the city of Wichita that was printed and published in the year 1878. As to my advertising in that directory, I will say perhaps I did. Just as like as not I did. If we did it was under the name of Kirkwood, Rutan & Juneau.

5767 Examining Complainant's Exhibit A–3, I will say no, sir, I don't recognize any of them. I can recognize that it was a pile bridge all right. I have crossed the bridge there hundreds of times in 1876, 1877, 1878, 1879 and 1880. No, I don't remember that Exhibit A–3 is a picture of the present bridge across the Arkansas river in the city of Wichita as it has stood since 1879.

Examining Complainant's Exhibit A–41, I don't recognize that as the Douglas Ave. bridge in the city of Wichita across the Arkansas river. The last time I crossed that bridge was about
5768 seven years ago. I crossed it in a company with a half a dozen carriages. We were going on the west side.

Examining Complainant's Exhibit A–1 again, I don't remember whether the flood of 1877 reached to the bridge or not. I know that it ran to the floor of my shop on Douglas Ave. all right
5769 enough. I don't think the flood of 1877 endangered the bridge, because there was nobody spoke about the danger to the bridge. I really don't know whether the flood of 1877 reached the floor of the bridge or not.

Examining Complainant's Exhibit A–1, I don't know
5770 where you show any water lines here. Noticing the braces on this exhibit on the supports of the bridge sloping down and reaching into the water, I will say I take it to be a rather high stage of water.

Examining Exhibit A–41, as to whether the water is high or low, I will say I don't know as I could tell, because there is your
5771 pier that seems to come down right here.

Yes, in 1876 there was an island in the river below the bridge. As to there being an island above the bridge, I will say I don't know now, but it seems to me there was a small island quite considerably above the bridge. I wouldn't state for certain; but there was quite an island below. As to Ackerman's island in the river there, I will say there were trees on it too. I don't know whether that island has increased in later years or not. I was speaking of the island below the bridge. I don't know anything about the island above. The one above was quite a little distance from the bridge, and it must have been quite a considerable distance, because I don't remember it. I remember the island below, because it was in plain sight of the bridge. As to the river at a low stage of water flowing in two streams at Ackerman's island, I would say it flowed under the bridge on both sides, and the middle of the river
5772 was dry. I don't know anything about the change there within the last fifteen years, because for the last fifteen years I have crossed the bridge only once, and that was about seven years ago.

Examining Complainant's Exhibit A–3, as to the sand bar being the island below the bridge, I will say this shows below here to be adjoining, almost, the bridge. My recollection is that it was quite a distance from the bridge at that time, and that there was wood and bushes on it; that it didn't abut right at the bridge as it does here. I should say that the dark lines at the left of the photograph in the water show the sand bar up next to the bridge,
5773 showing the water at a low stage when the picture was taken. If the flood of 1877 had gotten up so as to strike the floor of the bridge it would very likely have been of such force as to take the bridge out. I think the current at the height of that flood was quite rapid.

No, sir, I never knew the Little river to go dry. There was always plenty of water in it.

Yes, sir, I spoke of the failure of crops here in this county in 1904 having been caused by the drouth in the winter of 1903–4. During the fall of 1903, the winter of 1903–4 and the spring of 1904 down to the first of May, why, there was not much water, but the river was not any lower than it was the year previous. In 1902 and 1903 it was about the same general thing so far as the river was concerned. Yes, the river came up the first week in May, 1904, and remained up the balance of the year. Yes, sir, there was an unusual number of heavy rains in the State of Colorado and New

Mexico throughout the whole summer of 1904, so that
5774 we had a number of periods of high water in the year 1904. Yes, the river is high now, and this is the second flood we are having now. Yes, sir, this high water in the river now shows in the well just in front of my lumber office where this testimony is taken, and the water is about one and a half feet higher now than when the river is low. Yes, sir, the water rises in my well here seven or eight hundred feet from the river when the water in the river rises, and it falls very soon after the water in the river falls. As to an approximate time as to how soon after a sudden flood in the river I would notice it in my well here 700 feet away, I will say there was about five or six inches of water in there a week ago, and that came largely from the first flood. We have had a more severe flood than this one now. I don't recall of ever having seen my well here rise more than about eighteen inches from a flood in the river. Now, when the river has been very low for a long period of time, the water in my
5775 well would go down to that level; that is, there would be just a little water in it; or it would be simply wet, and it would go down to the same condition it was in twenty years before. Yes, this well is on the first bot-om, and there is another bottom still lower, something like 300 feet south of this and from there to the river. This first bottom is 300 or 400 feet wide. The bank of the river used to be about 300 or 400 feet from this office, and there has been an accretion here, as much as four or five hundred feet.

The river is being straightened up. The bank has not
5776 changed a great deal on the south side. The river bed is lower, to my observation, than it was twenty years ago, but it is narrower. I should think it is one-third narrower now, of its original width. I couldn't give you the exact width of the river now without actual measurements. I can only say that the river used to form a sharp bend here and the tendency has been to build and form an accretion here, you see, and the accretion was about 150 feet farther than it is today. Last fall it was 150 feet farther than it is to day, and these last floods seem to have taken a straight shoot and taken about 150 feet of accrued land, trees and all, and carried it away. I think we will have a better bottom by it. These accretions of the land have been growing about twenty years. These trees, some of them are eight inches in diameter. When I came here twenty years ago there were no trees or shrubs there. It is a wonderful change.

Yes, when I came here there was an island above the bridge.
The low ground on this side is all accrued ground. The
5777 stream in high water used to pass along through here within three or four hundred feet past here. But nature has filled this up and has filled the bed in from the Allen store to the city and formed solid land. Oh, yes, I remember a bridge built from the north side over to that island. It was only a few years ago it was taken down, and it was taken down because it was filled. There

was no more water passing through there. It was taken down about seven or eight years ago, and it had been filled for some five or ten years before that. Yes, the approach to the bridge on the
5778 south side has changed. They have got to fight that. I know they have driven piles and everything to protect the south end, but they have never lengthened the bridge to the north, nor cut any off. It is the same length as when it was built, my recollection is that it is now 1,400 feet in length.

As to the condition of the water level under the bottom lands along the river here, I will say that it does rise and fall the way it does in my well here right in this immediate bottom here, and when the river is up the water is nearer the surface. I think that is true everywhere on this bottom, and it extends back perhaps to the uplands or foot hills very nearly. Of course I don't know about that for certain.

As to there being a current to the underflow, I will say, yes, we all call it underflow. No, I have never made any scientific demonstrations to ascertain the current, but we read in the newspapers
5779 about the underflow. We have fellows here that we call "Underflow" So-and-so because they advocate this underflow. They claim it is a great benefit. Yes, there is one man living in this valley, not in this town, that is known as "Underflow" So-and-so. That is because he has talked that theory. As to my idea that the water filling in and raising this water level comes from the river (objection), I will say it does, because of the rising of the water in the river and at the same time meeting the other current of underflow. Yes, sir, it is my belief that the more water there is in the river as a whole and as a permanent condition of the river the higher the underflow will be. Yes, sir, that is based on my observations around here anyway. No, sir, I never paid any attention to that while I was living at Wichita.

As to the increased value of lands out here, I will say that is because we have raised better crops and because we have proven
5780 that this land can raise at least the cereals, the small seeds, such as wheat, oats and barley, successfully. Wheat is raised mainly on the uplands, and we do not pretend as a general thing to raise wheat on the bottom lands, nor barley either. The bottoms are used for alfalfa and pasture and hay. Very little wheat is raised on the bottoms. We raise vegetables at Hutchinson now, and we express them in here. We have always raised potatoes here, but they have always been rather a failure. Our potatoes are no good.

5781 When I said that the river now was as good a river as it was in the early years I meant by that that it was a good average flow of water, but during the ten years prior to 1904 it is not as wide, but it is straighter and deeper, and I believe that at its normal stage there is as much water flowing. I have been to the bank of the river several times last year during the dry time and there was water right adjoining my land. The boys were fishing

there. My judgment as to the condition of the river was based upon its condition in 1903 and 1904. Yes, there was water in the
5782 fall of 1903 and the winter of 1904. As to the drouth of 1903 and 1904, I said there was no rain, but there was water in the river at that time, and the drouth was not occasioned by the lack of water in the river during the winter of 1903 and 1904. I think there was just as much water in the river in the winter of 1903–4 as there was in the winter of 1902–3. Oh, yes, it increased in May; it always does. It never was known in any other way than to have a flood in May—in the last of April and May. Well, we will have another flood yet. The water in the fall of 1903 and winter of 1904 extended up the river as far as the eye could see from the bridge. Not in the middle of the river but on the side there was water all the time. I never was up the river much, but there was a little stream of water on both sides of the river during the fall and winter of 1903 and 1904, about the same as there was in 1902 and 1903.

5783 Yes, I know what they mean by the June rise. Why, it simply means that usually at that time I expect they get high water in Colorado, and rains, and that causes rain to be brought over this way, and when they have rain there we have a storm from the west and it brings us rain and it brings us water along the river and along all through here. In the early years the June rise usually lasted until about the middle of June. About the same as it will, I expect, this year, the same as it did last year. Then it will
5784 begin to go dry. What we call the June rise usually commences in the last of May and will last two or three weeks. Sometimes it comes with a great rush and wave. There will be rain to the west of us, for instance, and it will seem like a cloudburst and raise the river. The June rise has been noticeable in the last ten or fifteen years prior to 1904. Yes, it is as high as it used to be on the average, I think. I never kept exact tab on it. As to what caused the river banks to narrow, I will say I don't know, only the natural weight of water and the obstruction that the river—the current—kind of strikes, and one thing and another, only I know this here, that the river is straightening; and another thing, our last rise here before this one, about two or three weeks ago, we were very much afraid of our bridge here and the water was not as high as it was during the Pueblo flood, which was some ten or twelve years ago, I think, and yet it damaged our bridge and the water was going through there so much quicker and more rapidly that
5785 it damaged our bridge last year, and this year it weakened the south end, and yet the water was not as high up on the bridge, but the bed of the river being so much deeper and the stream being straighter and less of these eddies, you understand, that it formed a rapids that just went through there with terrible force, and that is what took this accrued land I had here. I don't know what caused the bed of the river to narrow, but it will do it. I don't know the reason. I know the bed of the river is deeper here

at Dodge City. I can explain to you why the river is narrower here. Now, above here we have what is known as City park. About twenty-five years ago R. M. Wright owned the ground on the west side of what is called Bridge street, and he got it into his head to have a forest there, and he succeeded. There was about thirty-
5786 five or forty acres, and we have a splendid park there. That used to be the river. Now, he goes to work and puts in perhaps a thousand sacks of sand above there and forms a dike, and he throwed the water off from that land, and every time the water would go over these sacks, you understand, the sediment and the dust and the live trees built up this park. It belongs now to the city. Now, by forcing the river up north of us here, you understand, it throwed the current on the other side and formed a bend here. That is what did it. This here accretion, I want you to understand now, this accretion here was caused by the artificial embankment made by sand bags half a mile from here deflecting the river from its natural course and throwing it on the other side, and now nature seems to have kind of balanced itself some way or other and filled this here and deepened the river. I don't know about this accretion extending on down the river. It would on this side, because from that land I spoke of now almost to the soldiers' home the river is straight and used to be in the form of an "S." There is only one island that I know of, and that is opposite the soldiers' home and that is also accrued land largely. Now, that island at the soldiers' home when we established the soldiers' home
5787 here, was a bare sandy island, and Sweeney went to work and got cuttings of cottonwoods and got the old soldiers to plant the cuttings in there and started these trees that you saw at the soldiers' home. That was simply a sand bar that was planted by the old soldiers thirteen or fourteen years ago. That would be still another obstruction done by man to narrow the river. Yes, it was done by man so far as this side is concerned. Of course I was benefitted by it. I am not complaining about that. But very likely if you will go from place to place you will find that the people have interfered with the stream. As soon as they have found there was a bar forming selfishness has went and planted trees there. I was told here that I ought to plant trees on mine. I said no, I wouldn't do anything of the kind, because it was interfering with nature. If I get accrued land without interfering with it, it is mine, but if I go and plant trees there I am stealing somebody else's land.

I don't know anything about the narrowing of the river except about half a mile from here. (Objection.) I know the
5788 cause of the narrowing of the river half a mile from here and down to the soldiers' home. That is five and a half or six miles or more. Above and below that I don't know anything about it.

We never were able to get water from the river to speak of here from irrigation ditches. Our ditches have always been a failure. So far as my observation goes, the supply of water is as good as it

was years ago. Yes, they would have had water in the ditches this year if they ran them, and they would have had every year in the spring of the year when these floods come down. At other times in the year there never was water to pay. I tell you that I saw the river perfectly dry at Wichita twenty-eight years ago. You
5789 could play marbles in the center of it. As to whether when these ditches were dug there was a prospect of ever getting water enough to operate them, I will say no, there was not, as a matter of fact. There wasn't to operate them the year round, because there was never any water in the river the year round. Never. You come here in August, September or October and you will see a dry river, but no more so than twenty years ago. That is the point I want to make. Yes, sir, there was a dry river here in September, 1904, so that you could see the center of the river. There was more water, though, in the fall last year than the fall before. That is true. But you could see the sand, and there was no water on the top of the sand in the center of the river. There was water on each side, yes, sir. No, when the parties dug these ditches in western Kansas there was no proepect of getting water to operate them the year round. They might have figured it that they would get sufficient water to operate the ditches for the purposes of irrigation when it was needed, but they certainly
5790 didn't get it. Yes, they got water through the floods of the spring and preserved it in lakes. There were eighty odd lakes covering from one to ten or fifteen acres, and they took the spring flood, for instance, and put it into those lakes. Yes, the ditches of western Kansas got their supply of water from the floods. They might have figured that they had a prospect of getting sufficient water to operate those ditches when they needed it, but they certainly misfigured, for they never did have. Oh, yes, they operated them, but not to the satisfaction of those who would pay for the water, because they couldn't get the water when they wanted it. No, sir, they didn't have water enough to operate them for a number of years, only for a part of the time during perhaps two or three or four years. No, they operated them part of the time during the year, but not when the water was wanted. As to the ditches I refer to, I have reference to the Soule ditch here. As to the other ditches in western Kausas, I don't know anything about the others. I am speaking of the Soule ditch right here. Yes, it would be an
5791 advantage to this county to have that ditch operated. That part is all right. But how are you going to get the water?

Farming is more profitably conducted in this county now than it was when I came here. There is a better class of farmers, and those that stayed here are all in splendid shape. They are out of debt. Oh, yes, good farming will bring better crops anywhere, and better crops bring a rise in the price of land. Yes, our town has been built up here in the last number of years, and it has had its influence on the price of land and the settling of the country. The town
5792 depends upon the country. Yes, there has been a general development all through this country regardless of the con-

dition of the Arkansas river. No, sir, if the Arkansas river could be kept more permanent and would have water in it it wouldn't be of any advantage to this country. It would be infinitely better for that water to be held west of us and be utilized. Utilizing some of it in the Soule ditch would be simply a small area. It wouldn't cover perhaps over ten or twelve thousand acres. Oh, yes, if we could irrigate ten or twelve thousand acres of land in this and adjoining counties, it would be of value, of course, but we have passed the line of irrigation here. We don't need it. I don't think it would be a particle of value to irrigate our land here, because the last three years we had enough rain to raise a crop. If the peo-
5793 ple of Colorado are allowed to use this water and the people of western Kansas are allowed to use this water west of us, it is all we ask. If the people of Colorado use all the water then the people of western Kansas don't have to use it. They will have plenty of rain without it. You create equal to an ocean there, and that is what we want, to moisten that dry atmosphere in the west. My belief is it is a great mistake about Kansas suing Colorado. It is a damage to the western part of Kansas. I have so expressed it to our Representative and to others, and I have been prominent in expressing that opinion, because when I believe a thing I stick to it. If they use the water in Colorado they won't have to have ditches in western Kansas. No, they haven't used it all in Colorado for the last ten years, because we have had water in the river right along here. We have had it in floods right along. I think between here and the State line we have lost half a dozen bridges last
5794 year on account of the water. Let the people of Colorado just take care of that flood water. Let them fill their land and make an ocean of it there. Yes, they had some heavy floods up there last year. They will have to let go of that water, you know; they can't hold it there. If the testimony in this case shows that outside of the flood season they do take it all and then don't get enough for the ditches in Colorado, as to how Kansas is going to get any water to supply her ditches, I will say from the evaporation of a large area of land. It will be equal to an ocean there or a lake. That is the way to reclaim the arid desert, is the depository of water sufficient to moisten the atmosphere to have rain regularly. The rainfall is heavier here and has increased in western Kansas. That is to say, it may not perhaps—our rainfall here—well, we are not too far. We are influenced by that same irrigation
5795 west of us. I don't think the rainfall has increased much in inches, but it comes in a different shape. For instance, a rainfall of an inch and a half, that will be two or three days coming down, whereas in the early days the same amount of water perhaps twice over would come down in two or three hours, and instead of doing any good would cause our fields to be as hard as the road, practically. Our climate is different. We have always had enough water here; it is simply that the water should come down more evenly and not in one bunch, for instance like a cloudburst. We are almost free

from anything like cloudbursts or heavy rains here. I don't know whether the rainfall at Garden City has increased during the last ten years. I am speaking about here. If my theory is correct, the rainfall would not necessarily have increased. It moistens the atmosphere. There is a good deal of moisture that comes down that doesn't come in rain, and yet it is as much benefit by reason of the dampness of the atmosphere, and dews, for instance. Yes. sir, it is my opinion that if the average flow of the river outside of flood seasons was used for irrigation in Colorado they would not need any irrigation at Garden City or any place in Kansas, and you could use all that water up there. No, if they use it all up there the underflow
5796 will not come down here. Now, gentlemen, you must take into consideration that water is indestructible. There is just as much water in the universe today, or on this globe, as at its first creation. You cannot destroy water. Now, I say that Colorado cannot hold that water there. And if Colorado uses that water there they don't destroy it, and in fact it must come from somewhere, either through the atmosphere or through the underflow. If two-thirds of the water that is used in Colorado goes into plant life and evaporates, it doesn't destroy the water. Oh, yes, it is destroyed as flowing water in the river, but it will moisten the atmosphere. No, if you take the water for irrigation in Colorado, all of the Arkansas river except at extreme flood times, it would equalize the
5797 underflow here through the valley. Yes, if they used all of the water in the river up there that they can possibly use, it would seep down into the river and cause a more even stream here. Yes, sir, it is all very true that when the river is up my well is up and when the river is down my well is down. But I say you can't hold the water in Colorado, It is impossible. Because you can't destroy it. It must either come back through the underflow, which would give us more of an even flow here, or else it must come to us by moisture of the atmosphere, because water is indestructible. You just refer that to any professor. (Objection.) Yes, when two-thirds of the water is evaporated by irrigation it loses its liquid form, but you don't destroy the water. Yes, if they use the whole
5798 of the Arkansas river for irrigation in Colorado, excepting at extreme flood periods, it would have the effect, in my opinion, of evening up the underflow here. It would be, on an average, higher, and the more you take out up there the more you would have here in the underflow, it coming in by a moist atmosphere; and if two-thirds of it evaporates up there then you will have more down here of the underflow and we will have less floods. Well if the water is not destroyed by irrigation, where does it go to? That is the point. I say it
5799 either goes to the underflow, which causes a higher or more even underflow, and will give, also, by means of a moist atmosphere, heavy dew and rain. We have it as the atmosphere imports it, and on a large scale. We have a stream here that the dampness is drawn from, and it strikes the dry clouds and it con-

denses. Here we have a kind of cloudburst, a hip-hurrah of a rain, whereas, if it goes over a wide area of moisture, a hundred miles in extent, it will balance our atmosphere, so to speak, and we may not have any more rain and yet it will come in a different form. They don't have to have ditches at Garden City. Irrigation is not necessary in western Kansas if Colorado can use all of the water.

Redirect examination.

By Mr. DAWSON:

5800 Yes, the river has taken a turn this season and has widened. It cut off about seven or eight acres of Fred Gardner's land and straightened the river. This river has always been a river of changing channels and shifting sands. It is nothing but shifting sand anyhow.

Yes, I spoke of my well here at the office being about six or seven hundred feet from the present river and said that the river at one time ran around where it was about 350 feet from the well, and if the river was running in its old channel now within 300 feet of this well I would call this land first bottom. Yes, sir, the reason I call it second bottom now is because there is a little bench off there where the old bed of the river was. It is a couple of feet lower than where we are now. No, this place here is not second bench such as is spoken of by the farmers as second bench along the river.

5801 Hardly that. That water I speak of which you can see in the open part of the well, which is six feet down now, is surface water. That is what we call the first underflow. Yes, ground water—the ground water or first underflow. My understanding of the real underflow that the Government is figuring on is this current that is twenty-five feet below now and is entirely independent of the surface water. That is my understanding. And that is what the test of the Government is being made on. Almost like the artesian flow, yes, sir, only it hasn't got the force to spout it out of the ground.

No, that variation I spoke of from a foot to a foot and a half in the open part of my well was the variation of the first ground water and not the variation of the 25-foot water. It doesn't touch that at all. There are really two seals; one of them is twelve feet of hard clay. The first is about twelve feet of hard clay, and then about two feet of sand, and then there is blue clay about four or five feet, and then below that blue clay is the permanent underflow—that is, the permanent water where this well gets its water from. Yes, the surface water I speak of as rising and falling a little is divided from that other by two impervious strata.

LARNED, KANSAS, May 4th, 1905.

5803 GEORGE K. LEE, Larned, Kansas.

Direct examination.

By Mr. DAWSON:

I live at Burdette, in Pawnee county, Kansas, the same county in which Larned is situated. Larned is the county seat of
5804 Pawnee county. I have lived in this county ever since 1878 and have been and now am engaged in the stock business. In the last few years I have also done some farming. I have always raised a little feed, or tried to.

I was first through Kansas here in June, 1877, but I am now living on the Pawnee. That is a tributary of the Arkansas river and flows into the Arkansas in this county. The Pawnee heads away in the western part of Hodgeman county or Gove county or up there somewhere, and it heads and runs throughout its length in the State of Kansas, yes, sir. In 1877, 1878 or 1879 I was on the Arkansas river and saw it only when I was down here at Larned; that is, to speak of. In 1883, 1884 or 1885 I used to drive our cattle down south of the river and hold them there from the first of
5805 May to September, and then drive them back. Well, I went down there four or five years. I think about 1883 I used to drive cattle down there for three or four or five years. We used to take all of our cattle down there, and sometimes we found no water in the Arkansas river at all during those years, only in little holes. At other times we would find it pretty nearly bank full. Once we had to put a team and scraper there and scrape out for—I don't know—a couple of weeks. That was between 1885 and 1886.
5806 Well, I don't know as I have seen any particular change in the character of the flow of the Arkansas river one year with another. (Objection.) I have seen it when it was dry since then, and have seen it when it was full like it is now or has been for the last few days.

As to the amount of land under cultivation at the present time up on Pawnee creek where I live as compared with what was under cultivation when I first settled here (objection), I would say the last ten years of it has produced more than it did the ten years back of that. There is a great deal more land under cultivation there now than twenty years ago.

In regard to the production per acre on the average for the last ten years as compared with that in the first ten years I knew it (objection), I would say the best crop I saw raised, that is, when it was first broke, was in 1878, up in that country. On what few pieces there were broken the wheat was awfully good and made the best yield it has since. But then the drouth struck it in 1879 and we didn't raise anything for a few years, and then it got along
5807 again until we raised something. As to the production in the last five or ten years as compared with the average production

for the first five or ten years, I would say the last five or ten years there has been a better average than before.

Well, there isn't as much water running in the Pawnee now as in former years. Years ago when I first knew anything about it, it didn't go dry. I never knew it to go dry. But since about 1893, I think, during part of the summer it would stop running and we would have to drive our cattle to another pasture or put in wind mills to pump water for them. Before that we hadn't a mill in our country. We got water out of the Pawnee. No, sir, there is no water taken out of the Pawnee in ditches for irrigation. As to accounting for its not flowing as constantly and as large a stream in late years as it did in the earlier years, I would hardly know how to account for it. There is more land under cultivation, and of course that would stop the water from running into the creek as much as it used to.

5808 Yes, sir, when I first came to the country a large per cent. of it was in buffalo grass, and of course it would run off from the sod ground more than from the plowed ground. Now, as to whether the water level of the country in my locality has changed since I have lived there, that is, any permanent change (objection), I would say, well, no, sir, I haven't noticed a bit of variation in our wells, and we are using some of the same wells now that we did twenty years ago. I am not using the same wells but there are some wells there that are the same as used then.

As to my having occasion to be at Larned or anywhere in the valley of the Arkansas river from year to year for the last twenty years, I would say I am down here to Larned two or three times a month. Larned is situated practically on the Arkansas river, yes, sir, on the north side of it. I used to have a pretty general

5809 acquaintance over Pawnee county among the farmers and the people, but there have been so many new-comers in here in the last few years I don't know anyone any more, but among the old timers I have a pretty general acquaintance. No, sir, I have never filled any official position in the county so as to bring me in contact with them, only in our own township. I was trustee up there a few years. As to my having heard previous to the commencement of this suit any complaint from the farmers or those living in the valley of the Arkansas river in Pawnee county as to the lowering of the water level resulting in injury to the land there, I would say I don't know as I have. I don't know as I have heard complaint either way. I haven't heard anything about it, no, sir.

As to the values of land in Pawnee county at the present time as compared with earlier years, I would say the value is a great

5810 deal more now than it was twenty years ago—treble. (Objection.) I don't think there has been any time when the lands, generally speaking, through Pawnee county, and especially in the valley of the Arkansas river, have been any higher or were held at any higher prices than they are now. (Objection.)

As to the general condition of the people of the county, especially the farmers and those living along the Arkansas river, as to being prosperous, I will say they all seem to be prosperous. (Objection.) No, sir, I have never seen the people of the county as a whole when they were in better condition or any more prosperous than they are at the present time. (Objection.)

Cross-examination.

By Mr. ASHBAUGH:

5811 Burdette is twenty-four miles up the Pawnee from Larned. I couldn't tell how long Pawnee creek is. It heads up near Lane county somewhere. It has two branches. The Buckner empties into the Pawnee, and the Hackberry and several of those little streams up the Pawnee run into it. The Sawlog runs into the Buckner in Hodgeman county. It heads away off southwest there toward Dodge, but I couldn't tell how near Dodge. I have crossed it many a time. I wouldn't say where it heads, but it comes
5812 from off in that way. During the last ten years the Pawnee has been going dry two or three months in the summer time there when it didn't before. Yes, during the earlier years the land was covered with buffalo grass. There was once in a while a piece that was broken, but I was speaking generally Yes, lately the land is broken up a great deal more. It is getting pretty well broken up in some localities in our county. Yes, the more you broke up of the land the more water it would take up. It wouldn't run off into the stream. I don't know whether during these later years more rain would go into the ground than would finally find its way into the creek there or not. If the sod has been broken up the water that is absorbed, if it is not too far from water, would likely seep
5813 through and get back into the channel again. But you take it up the Pawnee there, the banks are very deep. A great deal of this water evaporates, I expect. I think it evaporates after it has been absorbed in the soil, from below and above. If the ground is not wet clear down to the bed of the creek or the bed of the river and it is dry down there, it will absorb it. Yes, I said that the water level up around Burdette in the valley of the Pawnee hadn't lowered any in recent years. As to whether it is lower in the Arkansas valley or not, I will say I have had no occasion to know anything about wells down there or anything like that.

Yes, during the last ten years we have had better average crops than we had for the ten years before that. Some of our farm-
5814 ing is better and some is not. Oh, yes, we have got better machinery to work with. As to the land values being higher, the State is also developing, of course, and the land keeps an upward tendency with the development of the country, yes, sir.

Yes, sir, I spoke of the drouth of 1879, and I think 1893 and 1894 were about as dry, and they were the dryest years I have known since I have been here. Yes, I have heard them talk about the

grasshoppers during the grasshopper year. No, when we took our cattle down to the Arkansas river in 1883 to 1885 we wouldn't find water there all the time. There was one time when we had
5815 to scrape for it. That was some time in May. Yes, there was a June rise after that. The next time I went down there I think I had to ford the river. There is always a June rise along in the fore part of the season, along in May and June sometimes, but not every year. It seems to me I knew one year when the rise in the spring didn't come until along in July. Oh, yes, sometime during the summer months we have had a rise in the river,
5816 and sometimes as late as August. Yes, in the present year, 1905, there has been a rise in the last ten days, and the river is high right now.

No, I am not particularly familiar with the conditions of the country on the Arkansas river from Larned two or three miles west. I used to be a number of years ago but haven't been up the river the last few years to amount to anything. I haven't paid any attention to the river and don't know about sand bars and islands now that didn't exist in those earlier years. As to the river banks being as wide as they were when I came here (objection), I think in some places they are and in some places it has made new ground out into the river. I expect there has been a good deal of new ground made through Pawnee county. I think some of the trees that you see up the river there have been set out along the river in groves, and I expect nature put some of them in there and they have
5817 started up. It has been within the last ten or twelve years that we first began to notice them. Between Larned and Garfield within the last ten or twelve years there have been more trees set out and you would notice it more than you would before that, and there are lots of them that have grown naturally. I don't know whether the river bed is as deep as it used to be or not. I have not forded it for a number of years.

No, I am not familiar with the ground and the land for three or four miles above Larned between the Santa Fe track and the river. Years ago I was up there, but for the last ten years I haven't been up the river much. Yes, a week ago last Sunday we had a
5818 fine rain up in our part of the country. I heard them say it extended down here, but I didn't see it.

As to there being pools of water about three miles above Larned on the north side of the river and between the river and the Santa Fe track, I expect the water in those ponds is pumped out of the ground. If there are no windmills there, it comes from rain, I expect. It runs in. I think those pools go dry in the summer. They do with us. I couldn't tell you about these pools down here, as to whether they are natural pools or not. No, I couldn't state the origin of the water in the pools just above Larned.

5819 T. G. PAYNE, Larned, Kansas.

Direct examination.

By Mr. DAWSON:

I am sixty-eight years of age and live in Larned, Pawnee county. I don't do much business now. I have a farm. I have been a farmer and stock raiser, and I have lived in this locality since 1873. Yes, that was the first time I became acquainted with the Arkansas river, and I have lived in this locality ever since. I have had from half a section to a section of land in my farms. Yes, sir, I have always had more or less livestock—from a few head to a hundred head or something like that. No, sir, I have not been en-
5820 gaged in any other business enterprises or activities in this county for a number of years. Yes, sir, I have a pretty general acquaintance with the population, especially those who have lived here for a number of years, and that acquaintance has extended, with the old-timers, over a period of thirty years or more. The land that I owned and farmed is situated close to the Arkansas river. It is the south half of section 34, 21–26, one mile east of Larned, and that adjoins the river. I still have the lands that adjoin the river, and have been interested in such lands since 1873. I took it up as homestead and timber claims. I operated it and have overseen it myself ever since.

As to the productiveness of that land now compared with what it was in the earlier days, I would say I don't see a great deal
5821 of difference. Comparing its production for the last five years with any other five years during that period, I would say we have had the best production in the last five years. No, sir, I have no open wells on my place, but I have driven wells. I can't tell you that I have noticed any change in the water level on my land since I have settled on it in 1873, and if there has been any change I don't think it has been sufficient to be material or noticeable. Yes, I have lands that are known as first bottom lands. My farm consists of first and second bottom lands. I have property here in town where I live, and I have had that about eight or ten years. I have been familiar with the town of Larned since 1873. I have been coming into it weekly since that time.
5822 As to any change in the general water level of the country embraced within Pawnee county since I have been acquainted with the county (objection), I would say the Pawnee river has grown up with trees—willows and such things as that—so that there is not nearly the water in it that there used to be. As to the level of the water which underlies the surface of the ground having materially changed during the years I have known the county, I would say it changes every year whenever the river gets high, but as to any permanent change in the last twenty or thirty years, I don't know as there is. So far as I know the level has not changed.

As to my having heard any complaint before the commencement of this suit that the general water level of the country had become lower and the value of lands or their productiveness injured by reason of that fact in this county (objection), I would say
5823 that I hadn't heard any such complaint. Confining this answer to the Arkansas valley alone in this county, as to whether the water level has been lowered and the value of lands or their productiveness has been injured by reason of that fact (objection), I would say no, sir.

Yes, I am somewhat familiar and have been for many years with the lands in the valley of the Arkansas river throughout this county, and the productiveness of those valley lands in Pawnee county are now, taking a period of five years, more productive than they were in the earlier times, and the valley lands of the Arkansas
5824 river in Pawnee county are now more valuable than the same lands were in the past. My land on the Arkansas river was so located that I could see the river practically every day when I was living there, yes, sir, every day or every two or three days. Yes, I suppose I have seen the river on an average once or twice a week, almost, the entire last thirty years, and I can't see much difference in the river now as compared with what it was when I first knew it, in its general flow, taking it over a period of five years.

Cross-examination.

By Mr. ASHBAUGH:

When I spoke about the willows growing up in the Pawnee river I meant right near the mouth here. I think for half a mile or a mile up. Those willows have been growing up within the
5825 last eight or ten years. I don't know, sir, why they have been growing up within the last eight or ten years and didn't grow before that time during the first twenty years that I was in the country.

I don't think that the Pawnee is as large a stream now, and doesn't flow as much water throughout the year as it did during the first years that I knew it. Of course local rains raise the Pawnee river. I hardly know that the same rain affects the Pawnee river now as much as it did during the first years. I think in an earlier day the rains affected it more than they do in later years. Yes, the run-off was greater and the country was then covered with a smooth buffalo sod. I don't know, sir, why the Pawnee has gone down. I haven't heard any reasons for it. I have been up the Pawnee, up there forty or fifty miles, but don't know where it rises. Yes, there is a branch up there that is called the Buckner, I believe, and also the
5826 Sawlog, and the Pawnee up there is quite a little stream. The Sawlog is quite a prominent tributary, the Buckner is the principal stream, and there is a little creek up there that they call the Sawmill. I think the average fall of Pawnee creek throughout its course is not nearly as great as the fall of the Arkansas river. I

don't know that the city of Jettmore is very much lower than Dodge City. I never noticed the elevation of either of them or paid any attention to it.

5827 Yes, there have been a great many trees grown in the river bed of the Arkansas river since I have been in the country, and there are islands that have grown up in the bed of the river since I came here, and have become permanent and have become covered with trees within the last fifteen or eighteen years; yes, sir, and these trees are large enough to protect the islands. I couldn't say that a flood of an equal amount of water will do Pawnee county more damage in the Arkansas river now than it would thirty years ago. Of course I don't know whether the same amount of water came down then that does now, because I couldn't tell that; but I do know that in the last ten or twelve years we have been damaged more by water overflowing us than we were in twenty years before. As to what caused that damage, I would say the height of the water, I presume. I think it was in 1895 we had a flood that rose

5828 in the Arkansas river and in the Pawnee too, about the same time, that flooded a great deal down on the bottoms here that hadn't done it before that time or since.

Yes, in places the channel of the Arkansas river is as wide as it was thirty years ago. I think that on an average through Pawnee county there is as great an outlet for water as there was then. As to whether the banks are narrower than they used to be, well, now, it is owing to the islands. Of course the water goes on both sides of the islands. There are channels cut around among the trees, but I can't see but what just as much water comes down the river as did then—and stays inside of the banks I mean. Between Larned and Garfield, ten or fifteen miles above here, there is a lot of trees grown on the banks of the river, and some of them in the bed of the river, and they were not there twenty-five or thirty years ago, no, sir. And these islands are larger and evidently higher than they were thirty years ago. The bed of the Arkansas river is not less useful in carrying off a flood now than thirty years ago if it comes

5829 much slower down. If it cuts around through those islands and cuts channels among the trees, it has just the same room to cut down, if it makes it just that much deeper, which it does. No, I have never seen the bed of the river but what there were islands in it, but those islands have become a great deal more numerous and some of them larger and more permanent and are now covered with trees.

Yes, sir, the water level on my land down below town here rises and falls with the condition of the river to some extent. When the river is up the water level will be higher than when the river is down; but I haven't had an open well so as to particularly notice it. Yes, sir, I think the water level under these first bottom lands back to the foot hills rises and falls to some extent with the condition of the water in the river. (Objection.) Yes, I think that the

water under the first bottom lands responds to the condition
5830 of the river, and that fact is universally known through this community.

Yes, sir, there is better farming in this country now than there was thirty years ago, and the country has greatly developed within the last twenty-five years, and our town has developed and the whole State has developed greatly within that period.

Redirect examination.

By Mr. DAWSON:

5831 Possibly I have noticed personally the ground water showing an influence on the rise in the river, back half or three-quarters of a mile from the river. It will right in a bend of the river, and it comes from the south, and on the east. Yes, sir, the river makes a bend around here, and we are in an elbow, and the low bottom land I have spoken of as showing the influence of a rise or fall in the river is within a point that runs out, lying within this elbow or bend of the river, and the surface of that land on the average is from two to four or five feet above the surface of the water in the river at ordinary stages. Yes, sir, there are evidences of old channels and their courses running through this bottom, showing where the river at some time had gone through, and it is in these swales or low places that you can see the influence of the river
5832 when it comes. Yes, sir, it comes up there. Yes, sir, my land here originally was good hay land. It had hay on it. Yes, the water level is from three to five feet, I should think, below the surface of the land. I would think that the water level determined to some extent the production of hay on that land. I would say so, yes, sir. If the water level is up near the surface it is more productive for hay than when the water level is lower, on account of sub-irrigation. Yes, sir, there is no doubt but what there is sub-irrigation under my hay land down there. And the nearer you can keep that sub-irrigation to the surface the better it is for the productiveness of the land, unless you get it too near the surface. Within a few inches, yes, sir. Yes, sir, my land would be better and its productiveness increased by keeping the sub-irrigation as near the surface as could be reasonably done. I think so. No, my land now is in pasture and grain. Principally in pasture. That is, my lowest land. As to my land as a body being now as profitable for crops as
5833 when it was in wild hay, I would say it is in alfalfa, but if the water gets too close to the surface, within a foot or six inches of it, it is not so good. It would be better, yes, sir, to have it several feet from the surface. I do think the rainfall in this vicinity for the last ten years has exceeded what it was the first ten years I was here. Yes, sir, I think there is a difference in the character of the rains and the way it falls, that is, as to coming more gently and more evenly distributed now in the last ten years, perhaps. Oh, yes, that makes it better for the crops, even though the amount of rain,

measured by inches, would be the same. I have no theory upon which I account for this. I simply state the facts.

Recross-examination.

By Mr. ASHBAUGH:

Yes, sir, I think there is a greater amount of precipitation during the last ten years than before. I don't know whether the weather reports show that or not, and I don't know that they don't
5834 show it. I don't know that it is true that the precipitation comes in a different way now than it did but that the sum total of the amount of precipitation is not greater. But I think it comes in a different way than it used to. It don't rain so hard and wash the lands like it did, and there are no hot winds, hardly, in the last few years.

5835 PETER SCHNACK, Larned, Kansas.

Direct examination.

By Mr. GREGG:

I am sixty-five years of age, and reside in Larned township. I live out three and a half miles from the city of Larned, northeast. It is fully half a mile from the Arkansas river; that is, my south line is. I own a quarter section; that is, a homestead, yes, sir, and I have lived upon that land ever since I came here in 1873. I own some other land across the river, half a section, and I own
5836 one business block in town, yes, sir. The land I speak of as northeast of the town about half a mile from the river is bottom land, and I should think six or seven feet from the bed of the river. Some is higher. Yes, sir, I am somewhat acquainted with the adjoining land in that community. A man by the name of Shady owns the land between my land and the river. Yes, sir, most of the land around there is cultivated, and they raise all kinds of crops—wheat, oats, barley, corn, alfalfa, peanuts, sweet potatoes and garden truck. No, sir, I don't have any hay land. Yes, there is some hay land or pasture land near the river farther down, but I don't know how much.

5837 In regard to the crops on my homestead and in that vicinity near the river as compared with the crops in the earlier days, I would say that for the last five or six years the crops have been better. Yes, sir, better than ever before. But still I had just as good a crop in 1877 and 1878—that is, a wheat crop. Yes, just as good as now. There were two or three years that I had good wheat crops, but outside of that I think they are better for the last few years. (Objection.) Yes I raised Indian corn on this land. I think the first crop was in 1875 or 1876. And I have had Indian

corn on there since. Not every year. I don't plant it every
5838 year lately. Yes, sir, I rotate my crops.

Now, as to whether or not, barring drouths and grasshoppers and hot winds, there has been any change in the productiveness of that land or the amount of corn grown, comparing the earlier years with the later years, I would say that depends altogether on the rain we get in July, about raising corn. In some years we can raise good corn and some years we can't, and if we don't raise good corn it is because we don't get the rain in July when the corn needs it. As to whether those crops of corn are just as good in recent years as they were in earlier years (objection), I should say they were better, because we had plenty of rains in July. Good corn. Yes, when we have rains in July, timely rains, we can raise good corn here. As to whether crops of oats and wheat compare in later years with those of former years, I would say, yes, sir,
5839 the same thing is true of them when the season is favorable. It depends all on that—whether the season is favorable.

As to the general water level underneath the soil and back from the river on these adjoining lands making any material change as between the earlier years and later ones, I would say I don't know. I don't think it makes any difference, where I live. No, sir, I have heard no one in that vicinity complain that his crops or land
5840 was in any way injured by the lowering of the water level.

As to the value of lands in that vicinity, compared now with earlier years, I would say they are worth a good deal more now than they were then. Land was not worth over from $4 to $9 an acre, that is, railroad land, at that time, and they have been getting higher for the last three years. The price has gone up and up and now it will range from $25 to $40 an acre. I think that is about the highest value we have ever had yet that I know of unless it was for town lots close to Larned, but I was speaking of those lands along the river.

Cross-examination.

By Mr. ASHBAUGH:

Yes, sir, my land is half a mile back from the river on the north side. Part of it might be called first bottom and the other eighty is considerably higher, and some of it down close to the river
5841 is a little lower than that. Well, it is six or eight feet down to water at an ordinary stage of the river on my lowest land. It used to be. I don't know now, but when we first settled there I had open wells, therefore I know. I had open wells that we sank a barrel down into the sand and dipped the water out for the cattle with a bucket, and it was six or eight feet there on the lowest. Now where my house stands it is about fourteen feet to water, and the house is on the highest part of the land. No, I never discovered any change that I know of in the water level at one time of the year from another time. Yes, sir, it is a little more than half a mile back from the

river. I don't know whether the water level was higher after the river had been up for a long time than it was after the river had been down for a long time, because I never took any notice of it particularly. I don't know whether the land between my land and the river is affected by the condition of the water in the river.
5842 I never paid any attention to it whatever. I hardly ever go down to the river any more. I don't know whether the river banks have filled in there or not. I haven't been down there for five years, I guess. I can see lots of trees growing along there now, and I have seen them grow up for the last five or six years and maybe longer (objection), and perhaps back as far as ten years. There wasn't any at all the first few years, because I went along the river trying to get some cottonwoods to set out and couldn't find any trees only one here close to Larned, and I know, therefore, there was none there. Yes, it looks as though there were a great many trees along the river now. It looks like a forest from the distance.
5843 Town lots in Larnrd are not as high as they were once. They are higher now than when I came here first. Yes, we had a boom out here for a short time at one time, and we are starting in again now. Yes, our town has improved very greatly in the last three years, and our lands have more than doubled within the last three years and town lots are getting up again. I think
5844 there is better farming here in the county now than there was thirty years ago. We have more and better machinery, and we have better farmers.

Redirect examination.

By Mr. GREGG:

I don't think I saw many trees there in the '70's. But they began along about the '90's, I believe. I saw trees there then, but not sooner.

5845 E. E. FRIZELL, Larned, Kansas.

Direct examination.

By Mr. GREGG:

I am forty-five years of age, live at Larned, Kansas, and am mayor of the city. This is my second term, and I have lived here in Larned twenty-four years. For the last twenty-three years I have been in the hardware business, implements and machinery, and in the handling of land, farming, and live stock, and I consider that I am well acquainted with the land and farmers in this
5846 county. I own land myself here. The lands I own at present are located west of here in the Pawnee valley. I formerly owned quite a tract on the Arkansas river, of about a thousand acres. That was located along the main line of the Santa Fe rail-

road, seven miles southwest of Larned. Yes, it was Arkansas valley land and bordered on the river; and I have owned other lands along the river on either side. When I had this thousand acres, it was in 1893 and 1894 that I came into possession of it. I came to this country in the latter part of 1876 and have resided here ever since. I didn't reside upon this land to make it my home. I lived at Larned when I was working the land. I lived on a farm in this county from 1876 to 1881, near Garfield. Yes, sir, that is on
5847 the Arkansas river and the land I spoke of owning this side of Garfield borders on the river, where I was farming extensively. Yes, sir, I have had farm lands during all this time, and have been dealing in them too.

The lands have been more productive in the last six or eight years than they formerly were. In the earlier days we were raising some wheat and corn, and I experimented in growing onions and sweet potatoes. In referring to corn I mean Indian corn. I have grown some corn and sorghum and kaffir corn near the river, yes, sir. This Indian corn I spoke of was near the river, on this tract located seven miles southwest of here. There has been farm-
5848 ing done during all these years on the lands along the Arkansas river, and some years the crops were fairly good and in other years they were short. Comparing the productiveness of these lands for all these crops in later years with those of earlier ones, barring drouths and grasshoppers (objection), I would say the lands have been more productive in the late years, acre for acre, and I am referring to those lands which border upon the Arkansas river in this county, and all of them in the Arkansas valley.

As to the water level in the earlier years, I couldn't state so positively. It was in 1904 that I made three wells and put in three large pumps on this ranch. I made the wells five feet in diameter and sank the casings through the water-bearing sand, giving me seven feet six inches of water. They were sunk in the center
5849 of the Arkansas valley, about a mile from the river, on what we term the Arkansas Valley land, and it was eleven feet to water, and there is seven feet six inches of water-bearing sand. The water level seems to be uniform at that point. Yes, sir, I sank other wells at earlier times, but they were mostly driven wells and that didn't give me an opportunity to know as well as at these wells where I was irrigating, but so far as my observations extends at these former wells, I will say they seemed to be the same year after year. There is no change in the water level that I know of, and that is running back to 1877 and 1878.

I am fairly well acquainted with the farmers through this county, and as to whether I have ever heard any complaint from any of the farmers along the Arkansas river in this county as to the water level being lower and that their crops were thereby injured, that is, such complaint before the bringing of this suit (objection), I
5850 will say that I don't know that I have ever heard such a complaint. There was no change in the water level from

1904 to the present time on this ranch w-ere I made those wells, except where I would lower the water level by pumping. (Objection.) The pumps would lower the water from twelve to fifteen inches in those wells, but from day to day and month to month the water level would remain the same, because I was experimenting with the pump that I was manufacturing. These wells didn't rise and fall noticeably, so far as I could tell, and that was about a mile from the river, on about the center of the Arkansas valley, the valley being about two miles wide at that point. The river at that point is running from the southwest to the northeast, and the valley about the same. This being far enough up the valley that it has an average width there of about two miles.

5851 Lands have increased in value very materially in the past few years. The real increase in value has occurred in the past seven or eight years, and during that time they have gradually increased, yes, sir. There was no time in the past that I know of that these lands have been as high as they are now, and I think that is true along the Arkansas valley in this county.

Direct examination continued.

By Mr. DAWSON:

5852 We have had more rainfall in the past few years than we formerly had, and I should say that it gets more even and is better distributed than it was in the earlier days, and that is an advantage to the crops, of course, yes, sir. Even the same amount of rainfall better distributed and falling in a less torrential form will prove of more advantage in the growing of crops. Yes, sir, it will. As to how I would account for that, I had supposed the using of water west of us in eastern Colorado and western Kansas would affect the local rainfall in this part of the State; that is, using that water there for irrigation. I should say we have a more humid atmosphere here than formerly, and as to the difference in the matter of dews I should say we have more dews and more fog in the mornings than we formerly did. Yes, sir, that is true, that when this country was first settled, or at least when I first came here, there was a great deal of time in the summer when if a man were sleeping out of doors he would practically notice no dew.

5853 I have noticed that we now have heavy dews in harvest, so heavy that it interferes with the harvesting of the grain in the early morning, and I should say we don't have as hot winds here as we formerly had. As to accounting for that fact, I had supposed that the breaking up of the lands in the surrounding country and the farming of it more thoroughly and the stopping of prairie fires probably had an influence there. As to the effect the prairie fires formerly had upon the growth of the small timber that would start up along in the river, I would say it would destroy it to a great extent, and since the country has been fully settled up and each quarter section has been looked after by some one, we have had

very few prairie fires of late years. There is now a great deal of timber in the Arkansas valley near the river where there was none twenty-five years ago.

In regard to those wells that I sank in the valley land in the early days, say 1877 or 1878, I would say that I did have occasion to sink more of those drove wells. Yes, sir, in my business in the
5854 selling of pumps and windmills and the making of wells we sank a good many wells. As to taking it over a period of years, by the sinking of wells or in any other manner, as to whether the water which lies under the surface of the ground in the valley has subsided or materially changed in the last twenty-eight or twenty-nine years, I would say I have never known of it changing. As to whether I have heard any of the citizens of this county complain, before the commencement of this suit, that by reason of irrigation in Colorado or any other reason the ground water had subsided and thereby made their lands less productive or less valuable, I would say that I don't remember hearing any such complaint. Certainly in my business I come in contact in the course of the year with a large percentage of the farming population in Pawnee county along the Arkansas river, and I would say the average value of land in this county along the Arkansas valley would probably be $30 an acre. No, sir, it was not worth that much some fifteen or twenty years ago. I have bought land for the past ten years as low as $4.50 and $5 an acre, and that same land is now worth $30 an acre. Yes, sir, the town of Larned here is improving at this time very rapidly and the values are increasing here in town. It is the in-
5855 crease in farming land values that is building up our town. This town is exclusively dependent upon the farming lands which surround it.

Cross-examination.

By Mr. ASHBAUGH:

The land lying right near Larned is more valuable on account of it being near Larned than if it were distantly located.

Yes, there are probably better markets here now and better railroad facilities, and there has been a general development for
5856 twenty years. The conditions are a little more favorable.

I couldn't give the rainfall for the last two years here exactly, nor for the last five years. I don't claim to be posted. I have been here all these years and know that the rainfall is greater, but as to the exact number of inches each year, I couldn't state. The rains have been more evenly distributed of late years. As to what the weather reports show about the amount of precipitation, I am not prepared to answer all these questions. I couldn't say as to the records. From my personal knowledge I know it to be a fact. I should say there were years in
5857 the '80's when the rainfall was not half of what we have had during later years. (Objection.) I couldn't

say what the records show about it. If they showed otherwise I don't know whether I would change my opinion or not. I was raising wheat here and was interested in having rains. There have been years when there was no rain between the day of planting and the day the crop should have been harvested, in Pawnee
5858 county. It was quite dry during the wheat growing period in the early '80's, but I couldn't say as to what the record will show regarding that. I should say that the rainfall in later years was greater than it was in 1879. In that year we got no rain at all, but I couldn't say that the drouth that year was through all this country. As to the amount of rainfall during the last five years being greater than the first five years beginning with 1890, I will say, well, probably the rainfall hasn't been greater but it has been more evenly distributed in the past five years.

5859 In these wells that I put down and found water at eleven feet I was using water for the growing of market gardens—onions, sweet potatoes, etc.—and pumping water to irrigate several acres of land and to irrigate alfalfa and orchards. My attention was called to the water level repeatedly on account of my experimenting with the different pumps and the special pump I was interested in manufacturing. Yes, sir, this was a mile back from the river, and the water level there doesn't change when the pumps are standing still. I say positively it does not, because I have experimented in those three wells and spent large sums of money there determining what was best and how to make wells, what pumps to use and how to handle that water, and my attention was directed to the pumps and the water supply.

5860 I will say that at that point one mile from the Arkansas river the water level was not affected by the high or the low water in the river. That land is what is termed Arkansas valley land, a uniform valley for the entire length. I would say ninety per cent. of that valley was a uniform valley. (Objection.) It might possibly be termed first bottom. The first bottom is closest to the river, a narrow strip possibly a hundred or two hundred feet wide, and the general valley might be termed the second bottom, two or three miles in width. It is always referred to as the
5861 Arkansas valley. There is practically no distinction among our people here. There is a narrower strip along the river that might be called first bottom, with a depth of four or five feet to water. The Arkansas valley proper would have an average depth, we might say, of ten feet to water. I am not familiar with the fact that we have first and second bottoms.

In some years we have good crops and in some years poor
5862 crops, and the greater rainfall has given us better crops. There is very little of what we would probably term first bottom that is ever farmed. It is pastured. There is blue-grass and willows along the river. How long these willows have been growing I couldn't say. They were here when I came here. As to how many trees were along the river within ten miles of Larned

when I came here, I will say there was not one, and there are several hundred acres now. I would say that the timber began to grow most noticeably about twenty years ago and has increased very rapidly since. Yes, there are islands in the river within ten miles of Larned in either direction. As to the number of islands, I might say there are less. (Objection.) The channel on one side or the other in some cases has filled up and attached that island to the mainland and has become what we call accretion or made
5863 land. That has been going on to a certain extent through the county, yes, sir. I couldn't answer as to how many acres have been added to the amount of land along the river banks. (Objection.) I would suppose that possibly there may be, in Pawnee county, of lands that have been taken in or added, possibly a thousand acres. No, sir, the river banks are not as wide as they used to be. Yes, it is practically true all the way through the county that the river banks have narrowed. I think the channel of the river is as deep as it ever was (objection), but not as
5864 wide. It is true in many places that where there was an island in the early years now there is no island, because there is but one stream there and the island is attached to the made land, and the island and the made land are now grown up to trees. Yes, that is generally true through the whole county, and that is true in different places between here and Garfield. No, the river bed is not as wide as when I came here. (Objection.) I would say that the river is not in as good and perfect condition to carry flood waters now as in those earlier years (objection), because there is less
5865 river to carry the water. If the same amount of water in cubic feet should go down now, as to whether it would do more damage through the county than in the earlier years (objection), I would say the same amount of water would do a greater damage now than twenty-five years ago. (Objection.) We had greater damage done in the year 1895 than in any other year. (Objection.) I should say that the channel of the river was not in as good condition in 1895 to carry off the flood waters as it was in 1885. The river bed has grown up to willows and cotton-
5866 woods and other trees which were covering some of the shallow channels and islands, reducing the width, in 1895, when I speak of the floods. (Objection.) As to the effect of these floods upon our property, why, I will say the flood overflowed some of our low lands more that year than the river had overflowed for a number of years prior to that, and damaged some crops close to the river. (Objection.) As to that condition increasing, I can't say that we have had any more damage from overflow since 1895. Yes, I would say that the narrowing and growing up to willows and trees was increasing constantly rather than diminishing. (Objection.)
5867 Referring to that portion of the amended bill filed by the complainant in this case which says: "That during the summer season and during the dry portion of the year when there is neither rainfall in the State of Kansas nor melting snows in the

State of Colorado the bed of said river in the State of Kansas above the city of Wichita becomes practically and oftentimes wholly dry" (objection), I will say that is true. As to that paragraph which reads as follows: "During said dry portion of the year said territory is subject to high and constant winds and said winds change and fill up the bed of the stream or the natural channel thereof with drifting sands, dirt and debris until it is practically level with the lands adjacent thereto, and said obstructions are rapidly becoming permanent by growing vegetation, willows and trees," (objection),
5868 I will say that the drifting sand does not fill the river but very little. The obstruction in the river is increasing. As to that portion of the bill which reads as follows: "And at the times of sudden and excessive rainfall in the State of Kansas or sudden and excessive melting of snows in the State of Colorado the flood waters thereof cannot and do not flow down the natural channel of said river now filled and otherwise obstructed as aforesaid but overflow said adjacent bottom lands, washing channels there through, depositing their debris thereon and doing great damage to stock pastures, crops grown and improvements situated thereon, greatly decreasing and diminishing the value of said lands" (objection), I couldn't say that it is all true. The overflow has not been very destructive in this county. It doesn't wash channels to any great extent. Sometimes it does deposit dirt and debris along where there was none before, and a small amount of land is probably injured from it.

5869 The valley is about two miles wide at the point where I was farming, and right here at Larned is barely half a mile wide. The valley on each side of the river, including the channel, I would estimate at fully three miles from the rolling land on one side to the foothills on the other, or from foothills to foothills, and that is generally what is meant by the valley.

If the waters of the Arkansas river could be largely used for irrigation in the ditches in Kansas that were built along in the
5870 '80's, it would be an advantage to our country to have the water used in ditches west of us, I would say. That would be a double benefit to us. The flood waters would not tear out our bridges.

Redirect examination.

By Mr. DAWSON:

Yes, sir, it is true that most of the lands bordering the Arkansas river through this part of the country with which I am familiar are planted to some kind of crops, either grass, alfalfa, grain, natural grass or other crops each year. In other words, the lands bordering the river are not barren, sandy soil, uncovered with vegetation, and not drifting sand, no, sir. When the river is dry and there is a

wind storm I would say that considerable of the sand that
5871 one sees going through the air appears to come from the river bed, and when the river is in fact dry I would say that the wind blows more sand out of the river than it does in.

As to whether farmers are anxious to have this made land grow and assist and help it along, I would say my own experience has been to fill up the channels adjoining the river and cause the river to flow on the other side. In other words, I try to swell my acreage as much as I reasonably can by reason of the peculiar shifting character of the stream. Yes, sir, that is true. And I should
5872 say that has been general up and down the river. I have known of the channel being dammed to cause the water to flow on the other side, and I have known of trees being planted on the main land or added land, yes, sir. The overflow would have been on what might be properly called first bottom, which would appear to have at one time been the river channel. No, I can't say the people through Pawnee county have taken the pains to cut the timber or kill out the newly started trees growing up along the banks of the river so that the channel of the stream might not be
5873 narrowed. I cannot see that the timber has been cut to any great extent. It has rather been the endeavor of the people through this country, which by nature was slightly timbered, to facilitate and help on the growth of timber. Yes, sir, I believe that is true.

There are three bridges across the river in Pawnee county. One of these bridges, the one at Garfield, I should say is only about two-thirds as long as it was when it was built in 1878 or 1879. It was partially caused by the building of the grades and taking up the bridge—removing the bridge and making the grade. Yes, it is true that for the purpose of getting onto the bridge as it now exists certain spans or parts of the original bridge as they were falling into decay or for some other reason have been taken away and that an embankment has been built leading up to the present bridge. The river fills in both above and below that grade and reduces
5874 the width of the river. The bridge below Larned was built across one channel and it was filled in across the other.

In regard to the prairie fires being practically a thing of the past, I will say that it is on account of the roads being laid out on section lines and the land being cultivated. When I came here the prairie fires were a common thing every year.

In those early days there was a small growth of a species of willow on the islands in the river, sometimes called skunk brush, but we wouldn't find very many willows to any extent growing along the banks of the stream. The effect of the prairie fire would be to destroy what was growing along the banks, but it wouldn't reach the islands, no, sir.

I believe the first time I ever saw the Arkansas river completely dry was in June, 1878. It must have been about the middle of June.

Recross-examination.

By Mr. ASHBAUGH:

5875 The prevailing wind here is from the south. The sand hills along the river here are also on the south side of the river. No, I couldn't say that the sand making those hills did come from the river. As to the wind coming from the south, blowing the sand out of the river back into a sand hill on the south, I can say that it wouldn't do that. There is considerable sand blown from the river onto the north bank. Yes, the sand hills all along are on the south side of the river, and at Garden City also. There are several sand hills right at the south end of the bridge at Larned.

5876 I think those bridges were built longer than necessary at the time they were built, some of them. I couldn't say when the bridge at Larned was built. There was one built at Garfield, I think, in 1887 or 1889. I couldn't say when that bridge was shortened; possibly in the '90's. I think it was reduced in width in 1897 or 1898. I couldn't say that the bridge at Larned has been shortened a great deal to my knowlege. This bridge was really built last year. As to the bridge being shortened here at Larned, I think there has been a small amount of filling done on the south side, but very little. I think there were no spans taken out. Not that I remember of. The bridge below that I referred to was only built

5877 across the main channel of the river to the island. I suppose they put it in to shorten the bridge. (Objection.) The bridge was built in the earlier years. (Objection.) Fifteen years ago, perhaps. I can't say that the bridges that were built a number of years ago were built longer than has been found to be necessary for the condition of the river during the last ten years. (Objection.) If the bridges had remained long they would have taken care of the flood waters better than they now do since

5878 they are shortened. Yes, sir, they are narrowing the bridges at a number of places because they thought a shorter bridge would answer the purpose in some cases.

Cross-examination.

By Mr. CAMPBELL:

The building we are now in, the court house of Pawnee county, is on the north side of the river. Out south from here to the river it is a little over half a mile. Opposite here the river runs directly east. It bears a little bit to the south, just a little. The channel of the river used to be in the first bottom, up the valley

5879 seven or eight miles. There were some places there would appear to be some old channels that now might be termed first bottom, on the north side of the river, about two or three hundred feet from the present channel of the river. Apparently, there have been channels there. No, it is not the tendency along the line of the river to have accretions on the north side and to cut out

on the south bank of river all along. I gained sixty acres of land on the south side on a single quarter, and I gained 200 on the other side. Not directly opposite, no sir. When I gained the 200 acres on that side of the river nobody lost it on the other side, as I got the island that was in the river. Yes sir, the tendency of the river is to shift from one side to the other according to how the river runs.

Redirect examination.

By Mr. DAWSON:

5880 There has been practically no damage by overflow from the stream through this county since 1895. Nothing before 1895, between 1876 and 1895, so that the only damage I know of was done in that one year. During the flood of 1895 we had a very heavy
5881 rain the first of June. At that time Pawnee creek was flowing quite full. As to the average width of the lands that were overflowed, I would say probably it was not to exceed a quarter of a mile—the average width of the overflow—the narrow strip of first bottom or accretions. There are old channels in the first bottom land that would show that at one time it had a current of water there.

Recross-examination.

By Mr. ASHBAUGH:

Of that flood that came down in 1895, quite a lot of it was local and part of it came down the river from above. As to the narrowing of the river to gain lands (objection), I will say we have filled channels—narrow channels next to the land—at different times in this county. We filled the channels that were there to gain the land and prevent water flowing through so that we could cross
5882 over to the island for stock farming. As to that land, it has been washed out in after years. As to my having that land now, I will say, yes, sir, the channel has so filled up that it has now become a part of the mainland and doesn't wash away so bad any more. Yes, sir, I am keeping possession of that land.

5883 EMMA LEASURE, Larned, Kansas.

Direct examination.

By Mr. GREGG:

I reside in Larned, Pawnee county, Kansas. I came to Pawnee county in April, 1873, and located down in the southeastern part of the town here, right adjoining the town. I and my husband took up some land there. It was a timber claim of 92 acres, and
5884 that bordered on the Arkansas river and the Pawnee, together. They came together there. Yes, sir, we were on th

north side of the river. The town is right across the road from us, and our land runs half a mile east and half a mile south, and on the west end the river cut off all along the south side. There would be about half a mile fronting on the Arkansas river—just half a mile—and it ran back from the river on the west end about a quarter of a mile, I should think, and on the east end about half a mile. Yes, sir, we had a house there on the northwest corner, on ground that was quite a little bit higher than the balance of it. The river was just out off on the north of our yard. Yes, sir, we never
5885 lived anywhere else than there. Our house is still located where it was in 1873. We had a good view of the Arkansas river until we planted trees. That was the next spring after we came and when the trees grew to be so large, we couldn't see the river. That was not so very many years, as cottonwoods don't take long to grow. Well, from the east and south of us we could see the river very plainly, but there were other trees grew up so we couldn't see to the west. We couldn't see very
5886 well through the trees. Well, during those years sometimes there was water in the river and sometimes there was not. It was that way every year, as well as I can remember. No, sir, as I remember it was not an unusual occurrence to see it dry now and then. I don't know as it was totally dry. Of course I didn't see very much of the river—very far—but there would be little pools and then it would be dry a good part of the time. No, sir, there would be times when there would be no running stream and it would simply leave these holes from place to place in the river. Well, I don't know how frequently I saw it that way. I have seen it that way, though, very often. We wouldn't think very much about it at that time. That was not an unusual condition in
5887 those years, no, sir. As to taking those early years and comparing them with more recent years, that is, the last ten years, in regard to the flow of the water in the river, I would say that I don't notice very much difference; and as to the ten years before that compared with the earlier ten years, I never noticed any particular difference in it. Yes, in my opinion the river flows about the same—has about the same dry periods now—as in those earlier years. (Objection.) So far as I can remember, it is about the same.

Yes, sir, we grew crops on that land in those earlier years, and have ever since, and in comparing those crops in the earlier years with the crops of later years (objection), I should say, it was seasonable. If we had rains we had crops and if we didn't have
5888 rain we didn't have crops. And that is the way it has been ever since. If we had rain or hot winds. And if there were no hot winds and we had rain there were crops as well in the later years as in the earlier years; so that the crops produced depended on local conditions of the kind I mention, yes, sir. We raised corn and garden stuff, tomatoes and vegetables of all
5889 kinds, kaffir corn, and all kinds of things that are raised on farms. (Objection.) This land was not upland, no, sir.

I don't know what they call it. Bottom land is all I ever heard it called—just bottom land. Yes, sir, we had pasture on that land. It didn't go entirely to the river. The trees where we had it plowed made a space between the pasture and the river. Yes, sir, we used that pasture in the early days. The first two or three years we were there we cut it for hay and then we fenced it and used it for pasture after that, and that is part in pasture yet. That pasture land is not very far from the river. If you would put out twenty-five trees and it was half a mile long it would be just the width, then, to make that width between the pasture and the river. Well, that pasture land, as to its productiveness and
5890 the amount of grass that grows on it, is just as good now—if that is the proper way to answer it (objection).

Yes, sir, we sank wells on this land. One was at the northwest corner, at our house. It came up in the kitchen. That was about a quarter of a mile from the river, I should think. And we had one well at the barn. This well near the house was put down in 1873, and the one at the barn later. I don't remember just what year, but several years after the first one. We went from six to eight feet for water in those wells. We dug down to the first water, yes, sir. No, sir, I didn't notice any variation in the water in those wells. Of course we sank our wells then when we came to the first water. The wells were put down deeper and we could pump water there all day and never tell any difference. There was another well put down in the field not far from the center of the
5891 place. It was half way between the east and west lines of the land, and it was a little nearer the river, and I think it was on lower ground than the others. I don't think we went six feet for water there. It was not more than that. That well has only been down a few feet—perhaps six or seven. The water there remained about the same, but they took that up after it had been down about two years. They were going to make an irrigating ditch and so took it up. Of course it had just as much water as they wanted; it was not on account of that. Yes, sir, so far as I know the water level of those wells remained the same all those years. We never knew of any difference.

5892 Yes, I knew some of the other farming people around there. I knew the farmers generally, and as to whether I have ever heard any complaint that their crops were injured or affected by the lowering of the level of the water underneath the soil, I would say I never heard them say anything about that. They may have said so to others, but I never heard anything of the kind, and I never heard them complain of any injury to their crops, nothing only concerning hot winds and dry weather. Yes, sir, that is all that I ever heard them complain of—that their crops wouldn't be good if they had hot winds, or something of that kind.

Cross-examination.

By Mr. ASHBAUGH:

5893 In referring to the water level, I suppose the underflow is what he (counsel) means. That is what I took it to be. The underflow where you dig down until you get to water. And of course if that has sunk away there wouldn't be any water there. That is all I know about it. We always speak of the underflow as when we were digging I have heard Mr. Leasure speak of only digging down a short distance, and he would speak about coming to the water—the underflow he always called it. I don't know why we call it an underflow, I am sure, but I suppose the water from the river flows under all this sandy land. That is my idea of it. That is, the river bottom is sandy all around down in the bottom, and the water flows through this sand. That is a general term that is applied to it, as far as I know. I think it is a prevalent one here among all of the people. And when I speak about the wells never going dry, I don't see how we could pump them dry unless
5894 we pumped the whole valley dry, no, sir. I shouldn't think it would lower it by pumping all we could. The river is up now, yes sir. No, I don't think the water rises in that well naturally, because they are not open wells but driven into the sand. We can't see water at all. All three of these wells are driven wells. You could just pump and pump and pump and you could never get them dry. As to the way I judged of the water level being simply that the drive well was driven into the underflow and because we couldn't pump that dry, I will say that is the only way we could tell anything about it.

No, I don't profess to be an expert upon the productiveness of different lands. I have just given my attention in life to my household duties, that is all. Yes, sir, we planted trees along be-
5895 tween our house and the river, and that obstructs the view to a certain extent at the present time. Yes, the river sometimes gets low and at other times it is high, but I don't know how it is on this 4th day of May, 1905. We moved last September up into the west part of the town. We sold that place. During a good share of 1904 there was a time when there was water there and part of the time it was down low again, just about like it is every year. I couldn't tell you what time of the month or anything about it, because we would just look at it and see it at any time.

The river is usually low in the summer time. I can't think right now just how low it was in the summer of 1904. I had no occasion to pay any attention to it, and I never had any occasion to pay any attention to it in particular. We would just see it and just
5896 know it like anybody else seeing anything, I guess. Yes, it has been just that way ever since 1873—that sometimes in the year the river was high and sometimes low. Yes, sir, and that is practically all I know about it. No, the river does not remain high very long, that is, full banks or over, but of course I never

thought anything about it. No, sir, I can't remember the first time I ever saw the river go dry. I think it was about the first year we lived there, in 1873 or 1874. I couldn't say what year. But it was right in those early times. I don't know when I saw it go dry the second time, because I have just seen it dry and then I have seen water in it. That is the way it has been, and that is all I can say,
and it has been so ever since 1873 when we lived there. No,
5897 sir, I couldn't tell at all whether there was more water ran
down in one year than another year. No, I have had no basis to form any judgment as to whether there was more water at one time than another. I don't know whether the bank has been receding or not. I couldn't say that it has. I don't think there is enough to amount to anything if it has. The trees are right along the river bank just as they always were. The first row is right there, and so on back. I don't think there are any more islands in the river channel now than when I first came here. There are some in the river channel now. I suppose when the leaves are off the trees we could see the islands right south of our house, but we have a grove there so that we couldn't see over into the island after the trees grew up, but the island is there. No, I don't pretend to say anything about the crops, comparing one year with another, as to which was the better. That has not been my part in life. I only know just what I heard them say and know by our own crops, of course.

5899 WILLIAM H. BRINKMAN, Larned, Kansas.

Direct examination.

By Mr. DAWSON:

I am sixty-eight years of age, and have lived in Pawnee county, Kansas, since 1874, and I settled at Larned, I should think about half a mile from the Arkansas river, and was engaged in selling lumber up to 1899. I was away from Larned most of the time from the fall of 1899 until the fall of 1903. I was out of the State most
of that time, but I still called this my home, and even during
5900 those years I was back and forth several times. It was my
home during that time. Yes, sir, my lumber business brought me in contact with a large number of the citizens of Pawnee county, and I was quite familiar with the crop conditions, I think. It is somewhat important to one in my business to know what condition the people are in and what condition the crops are in, yes, sir. (Objection.)

Yes, sir, I saw the Arkansas river dry in the early years so
5901 that there was no flowing stream in it. I think the first time
was in the fall of 1874. I think it went dry again in the fall of 1878 or the summer of 1879 and 1880. I think it was dry most of the winter, until in May of the spring of 1880, and since that time,

well, it might have been dry for a short time. No, sir, I never have seen it at any time when it was dry for so long a period as it was in the fall and winter of 1879–1880. That was the longest dry spell we had. Well, no, I have not lived near enough to the river here at Larned so that I have seen it from week to week or month to month practically all of those years. There were times maybe for a month I wouldn't pay any attention to it. (Objection.) But taking it one year with another, there might be a month that I didn't see it, but I was in the habit of seeing the river from time to time generally, say once or twice a month. Yes, sir, sometimes I might and other times there might be a month or so that I wouldn't see it, and at other times there might be several days in a month, yes sir.

5902 (Objection.) Yes, when the leaves were off the trees if the river got high enough one could stand in the window of most any house around this town and see the river, if you were on the hill here. (Objection.) Yes, sir, I live on the hill but I have only lived there sixteen years. From what I have seen and known of the river since 1874, taking it by periods of five years, so as not to get it all in a drouthy year nor in a wet year, and comparing one period with another, I should judge that for the last three years—I haven't paid so much attention to five years—there was more water went down the river than before that for the twelve months

5903 in the year. (Objection.) What I mean to say is that there is more water in twelve months now than there was fifteen years ago in twelve months. Now, as to whether for practical purposes as a river it is as good at this point now for the last three to five years as it was for a similar length of time during the earlier years (objection), I would say there is less dry river in the last fifteen years than before that. The river has not gone dry as often in that length of time. No, sir, I haven't been engaged in farming, myself.

5904 As to whether I ever heard any complaint among my farmer customers along the valley of the Arkansas river in Pawnee county that the water level of the county has been lowered and that their lands were being lessened in value and their productiveness lessened, before the commencement of this suit, no, sir, I would say I never heard any complaints. (Objection.) As to the average crops raised in this country now compared with the early years, I will say that we have crop periods here, but the crops have been better for the last five years than they were for any five

5905 years before, and I think that has been because we have had more rainfall. I have heard it remarked that we have had more general rains in the last two or three years than before that. (Objection.)

As to the values of land now compared with earlier years in the Arkansas valley in Pawnee county, I would say that the price is a good deal higher than it used to be. (Objection.) I have been somewhat familiar with the general values of farm lands in this country for a number of years, and lands have been pretty cheap for

the last three years now. The price is rather low, but it is as high now as it was before. I should think they are three times as high now. I say that they used to be cheap. The price used to be low, and now they are high as compared with what they formerly were, yes, sir. No, sir, the highest price they have ever been is
5906 right now. (Objection.)

Cross-examination.

By Mr. ASHBAUGH:

During the years I have lived here I have been selling lumber at the lumber yard right near the Santa Fe railroad at Brakeman Brothers. I have lived on Broadway up here since sixteen years ago. It is on the north side of the river, and the lumberyard is on the north side of the river. When I moved I moved two or three blocks west of there, on the same side of the river. I have always done business on the north side of the river. Yes, sir, my
5907 business has been the lumber business for thirty years last fall. Yes, sir, I had some land in this county that I just took in on a debt or something like that and got rid of it as quick as I could. I had it farmed. It was south of the river. No, it was upland. It was back from the river about four miles. I never owned any bottom land in the county.

Yes, sir, the river went plumb dry in 1874, and perhaps was dry from August, 1874, up to October of the same year. Yes, sir, that was the grasshopper year. The next time I saw the river go dry was in 1878 or 1879. That was the drouth year. Yes, 1879 was the longest dry period I have ever seen in Kansas. The river
5908 then went dry in the fall of 1878, and there would be once in a while a little water would come and then it would go dry again. I was in Dodge City in May, 1880, and we all went down to stand on the river bridge to see the water come down. That is how I know it was dry in May. And then it had water in it for a number of years, yes, sir. After 1879, as to when I ever saw it go dry again, I will say I don't just remember, because we are not surprised to see the river go dry in the summer time, that is, during July and August. I couldn't tell you how it was in the spring of every year with the exception of 1879. In the springs there were times just like now. Now the river is away up. It has been up for a week or ten days. These periods of high water would last from one to two weeks and sometimes a little more. Last spring, 1904, we
5909 had a freshet like this. I think it lasted a couple of weeks. No, the river didn't go clear dry then; there would be a little water in it. I think there was one year or so it never went clear dry, but there was just a little water running. I don't remember of it going entirely dry in the last four or five or six years. It was not dry in the winter of 1903 that I know of. I don't think so. There was a little water in it all the time, just the same as there was in the fall. The only occasion I had to notice the river or to know whether

it was wet or dry was just by hearing the farmers talk and seeing it once in a while. No, I would cross it once in a while on some business, but I had no special business on the other side. Sometimes we would have business to take us across. As to the river bed being as wide as it used to be, I will say, no, sir, it is not as wide. (Objection.) I don't think the river bed is as wide. I am satisfied
5910 it is not. As to islands in the river, I don't know about that. Sometimes there are islands formed and then they wash out. I don't think there are more sand bars than there used to be. As to how much the river banks have narrowed in the last ten or fifteen years, it is pretty hard to say. I think immediately
5911 west of the bridge it may have narrowed two rods, and it widened on the south side. It cut back on the south side some. Not as much as it narrowed on the north side, though. It has filled in on the north side just above the island, I should say two rods, but I don't think more than that. I don't think it has filled in ten rods. No, right south of the water works building, that is not all land filled in there. Right at the water works building it has come this way. It has cut out of the bank. That is kind of filled in. There is a kind of point there. That used to cut into the Pawnee there, and somebody put rock in there and made a dam. That has filled up practically where the water used to come into the Pawnee. Yes, you could always see some islands from the bridge there thirty years ago. There were shrubs and small bushes on them. Yes, sir, there were cottonwoods along here thirty years ago, not these small cottonwoods, but there were a few large ones
5912 right over here south of the bridge and a little east. I never was at Mr. Keller's land down the river here. I don't know how much there is there. I heard them say that he had put in some barrels and made land there, but I never saw it. As to how long ago these trees began growing along the river and on the islands, I should judge they commenced growing mostly in the last ten or twelve years and have grown mostly since that time. There have been more seeded. These folks planted cottonwoods groves, you know, and there was more seeded. They were planted in the first place, and the seeds then dropped in there.

As to the depth of the river, I can't tell much difference by the bridge. They are using longer piling to make that bridge than they used to; but the length of the piling wouldn't show the depth of the water in the river, no, sir. (Objection.) Then we used
5913 18-foot piling for that bridge; now they are using 26-foot piling. The longer piling are not more serviceable, because they have washed out now. The current seems to be stronger and it washes them out.

I cannot recall how the river was in 1894, nor in 1895, nor in 1898. In 1888 I think it was a pretty good season for us here, because we had a good wheat crop that year and I think the river was all right. I can't remember about 1890. 1892 was a wet
5914 year, and I think we had a pretty fair flow of water in the river that year.

Our local rains don't affect the river very much. The large flow in the river comes from the mountains. Yes, it takes a very excessive local rain to affect the flow of the river here. Just an ordinary rain that might be useful for the crops wouldn't affect the flow of the river appreciably. The floods come from above, from heavy rains or melting snows, yes, sir. Speaking of greater precipitation here now than in former years, I mean by that that the rains are better distributed. I don't mean to express an opinion that there is a greater amount of precipitation, but they are better
5915 distributed, and when rains are well distributed it is better for the crops. The same amount of rain coming at the wrong time of the year might result in poor crops, yes, sir; so that it is the seasonableness of the rains rather than the amount that affects the crops, yes, sir. No, sir, I don't know as I have paid any particular attention to the amount of water in the river from 1890 down to 1900. I couldn't tell that. I know the river banks are narrower and there is a good deal of made land along the banks. I think that is true all through this country; it is as far as I know. (Objection.) Yes, sir, I think some trees grow outside of the old
5916 river bank. I don't think any of the islands down there have become permanent except this one out here. There are some islands that have shrubs or small trees a year or two old on them, but they are liable to be washed out by the next flood. Yes, even if an island does become more permanent and trees grow on it, it may take a heavier current to wash it out, but it does wash out. But it would take a heavier current to wash it out than though there were no trees on it.

Yes, sir, I have heard them talk about the underflow. What it is is something I can't say. It is the water under the surface that you can't see. I think that is what they call it. I don't
5917 know anything about how far back from the river it goes. I don't know anything about it. (Objection.) As to the first time I heard of this underflow, I don't know. It is only of late years that they have talked about the underflow. As to what they say about it, why, I have heard one man say it was less; others say they can't see any difference. As to the level of the underflow rising after the river has been up and falling after the river goes down (objection), my opinion is that it does rise and fall with the
5918 level of the water in the river. As to whether that is an admitted fact by everyone here, I don't know, but I think that that is the opinion, so far as I ever heard an opinion expressed. (Objection.)

Yes, sir, the better crops they have here the more lumber we can sell, and that is the way I was interested in the crops, and the poorer the crop the less lumber we sell. No, sir, as to the actual productiveness of a particular piece of land located by the river at one time in comparison with another, I don't profess to have any information about it.

Redirect examination.

By Mr. DAWSON:

A high stage of water in the river raises the underflow.
5919 No, I haven't investigated that matter, but that is what the people say about it. Whether it is true or not, I don't know. As to the stage of the river during the various years, like 1890, 1894 and 1895, I would say that I am not able to give the particular years during all this time, that is, to pick one out from another, not unless it would be an extreme case. (Objection.)

Yes, sir, I was county commissioner fifteen years and county treasurer two years, of this county.

5920 A. A. THORP, Larned, Kansas.

Direct examination.

By Mr. DAWSON:

I reside at Larned, Kansas. I came to this locality in March, 1873, and have made this county my home. Not right here in Larned. I have lived out in the country and then came to Larned. Yes, sir, I lived in the valley of the Arkansas. Up to 1889 I was a contractor here in Larned, and since that time I have been in a county office. I was elected sheriff in the fall of 1889 and served four years, and then in 1898 was elected representative in the
5921 legislature, but I am holding no office at all at the present time. At the time I lived in the country I was on a farm; that is, I made my home on a farm the first fourteen years, up the Pawnee river here three miles. (Objection.)

As to whether there has been any change in the Pawnee river in the amount of water it carries one year with another in late years as compared with the earlier years, I should say yes, sir, I think there has been a change. In my opinion there is a good deal less water in that stream now than in the earlier years. I think the Pawnee heads in Colorado, just over the line. It is up in that neighborhood anyhow. No, sir, I have never been at the head of the Pawnee, and there are no ditches taking water out of the Pawnee for irrigation.

5922 As to the amount of land bordering on the Pawnee which is under cultivation as compared with that which was under cultivation when I first knew this country, I would say, yes, sir, there is more, but I don't know what effect that would have on the amount of water which runs into the Pawnee. No, sir, I don't know anything about that; nor do I know what is the cause of the Pawnee's flow falling off during the later years.

As to the amount of crops per acre raised in the valley of the Arkansas river in Pawnee county in later years compared with those raised in the earlier years, I would say that in the earlier years we

raised what we call soft wheat. It makes a different growth from the hard wheat. And when we raised the soft wheat—I don't know as there is very much difference in the soft wheat. And then when we began to raise the hard wheat—there are a good many more acres now, and it seems to me there is more raised per acre than in the former years. Now, as to whether lands of late years are more or less productive along the valley of the Arkansas river in
5923 this county than formerly, I would say that they are better of late years than they were in former years, or as good.

As to whether I have had occasion to observe the level of the ground water in the valley of the Arkansas river in this county, I will say that I have had such experience in putting down wells, is about all, in the early times and in the later days, and from that I think the level of the underflow is about the same.

As to whether in my business or my association with the citizens living along the valley of the Arkansas river in Pawnee county I have ever heard any complaint before the commencement of this suit as to the level of the ground water falling or sinking so that their lands are less valuable or less productive, I would say I have not, no, sir. As to whether I have seen the Arkansas river dry in any of the earlier years so that it had no flowing stream in it, I would say in the earlier years I don't know that I did. I
5924 have seen it very nearly dry. As to locating the years 1878 and 1879, I would say it is pretty hard to do that, but it was nearly dry one year in the '70's, so much so that it disappeared except in low places. It was so dry that it had no running water.

As to the value of lands in this county in the valley of the Arkansas river compared for the last two or three years with what they were in the years before, I would say they are of greater value now.

As to the character of the rainfall in later years as compared with former years, it seems to me there has been more rainfall in later years, yes, sir. I think we get more seasonable rains. I don't know as we get any more rains, but we get it in seasons so that it makes the crops better. Of course I have my own idea as to the cause of this change, and that is, I think it is the cultivation of the southern country and the turning under of the buffalo grass. We have less hot winds and such like now to contend with in this country.

Cross-examination.

By Mr. ASHBAUGH:

5925 Yes, sir, I am a carpenter and contractor, and I lived in between the Arkansas and the Pawneee, about three miles above Larned, within the Arkansas valley. I don't know that the Pawnee river is lower than the Arkansas river. Of course when we had the Government fort here, the Government survey, I formed an idea that it was about the same. As to the Pawnee being lower,

I don't know anything about that, and I never heard it mentioned before. I don't know that the fall of the Pawnee creek
5926 is less than the fall of the Arkansas river per mile. I don't know anything about that. The crops seem to me in later years to be better, and I think the rains come more seasonably, but I don't think any more rain falls in the aggregate in any particular year than in the earlier years. We used to have to contend with hot winds. As to the year 1904, the Arkansas river was dry part of the season and part of the season we had high water. In the fall we have high water. Before May, 1904, I think it was dry for a while. Yes, sir, I remember one heavy flood in the Arkansas river in September or October, and the one that caused the Eden
5927 wreck, and one that caused the washing out of the Santa Fe tracks in New Mexico.

In 1893 or 1894 we had high water, and then the water would go down and the river would go dry. I don't know how long those dry spells would last. Of course I never had occasion to keep track of any such thing, and don't know.

In 1893 I moved across the river on a farm, and crossed the river nearly every day, but to remember the time and length of time of the drouth in the river or the dryness of the river, I paid no attention to it. I had no occasion to keep track of it. As to the time when the river went dry in one of those years, what makes me remember is that we went out fishing in those low places. We would take a pitchfork and throw the fish out; but there was no running
5928 water. Yes, there used to be pretty good fishing in those early years as an average along every year. No, I haven't known it within the last ten years. I am not much of a fisherman. As to there being a good deal of fishing in the river from 1873 to 1888, I will say I don't know much about that. I was too busy at something else to keep track of it. I think it was along about 1867 or 1877 or 1878 that we threw the fish out with the pitchforks. It might have been the drouth year of 1879. We found the fish in the low places where the water had settled back and the fish had run in them low places. I never knew that to occur since.
5929 Yes, that was sufficiently notorious to call the attention of the people to it.

Yes, as sheriff I drove around the county a good deal, and I am pretty familiar with the river and its banks and its bed all through the county. The river banks are not as wide as they used to be, and there is a good deal of made land along the river on each side, and it sometimes extends quite a ways down into the original channel of the river bed, and that land has now become covered with trees. Yes, sir, there are a great many more islands in the river channel now than there used to be in the early days—scores of them where there were not
5930 any thirty years ago. These islands have become covered with trees and brush. Last fall I was at work on the bridge at Garfield. There was four or five hundred feet of made land on

the southeast side of the Garfield bridge, and you can't see more than half a mile either way from that bridge for the islands, because the view is obstructed by the trees and the brush. Yes, it is true that between Larned and Garfield the whole bottom of the river valley looks like a forest today. As to the river bed having narrowed, it would vary a good deal in places. There are some places I think it is one-third narrower than the former bed as it was in the early days, and I believe that would be a fair average—one-third—through the county. I don't know about the river bed being as deep as it used to be. When there is high water the river is lower; then if the water disappears that sand seems to wash in there and gather up; but as to the river bed being as high or low as it was thirty years ago (objection), I don't know about that. It may
5931 have filled up some. It may not be quite as deep. My impression is that it is nearly as deep. (Objection.) Yes, sir, I know Mr. Keller's place down below Larned. I know there is quite a strip of made land there, covered over now with trees that
5932 grew naturally. Yes, there are other pieces of land that have increased in size along the river—several of them. There is one right here just below the bridge; it is called the Athey place. It has made considerably. Now, the reason I notice that, in an early day I was hunting buffalo over there and in the very early morning I got over there on the Rattlesnake and lay down on a sand bar by an elm tree that was there. That was the bank of the river. Now I should say it is three or four hundred feet from that tree, and whether it has cut out this side—I think it has cut out some on this side, quite a lot, but not nearly as much as on the other. Yes, sir, there is a good deal of made land at the south end of the bridge, and the original bank of the river was located back pretty well to the sand hills, and I should think three or four hundred feet back from the bank of the river now. No, sir, I don't know how wide the Government survey showed the banks to be here. Yes, it is true
5933 that a good many people are having their fractional pieces of land along the river here increased by the filling up of the river. We have had that in court here.

As to the value of land being greater, I suppose it is caused by the immigation coming West and this craze for land. There are better improvements in our county than twenty years ago. This county has always been pretty well improved. Fences and houses and barns are improving all the time. Yes, there has been a general improvement all over the State. Yes, there seems to be
5934 a craze at the present time for land. This has lasted two or three years and is getting worse all the time. No, there was not very much of a craze for land here in 1903. Yes, there is considerable speculation in land here just at this time. It has lasted for a couple of years, I guess. It began, I think, in 1903; that is, real estate men began to boom it. They make the boom a good deal.

As to the underflow that I spoke of, I heard Mr. Brinkman ex-

plain that. I think that is about the meaning—that it is the water underneath that you cannot see. I couldn't tell how far
5935 that water goes back from the river. As to the width of the valley just above here between the two rivers, it runs for miles up there. Of course there are hills up there by Garfield, but they dig for water and get water there within a good distance, and that is called the Arkansas valley and the Pawnee. We generally have to go in the Arkansas valley in order to strike the underflow about twenty-five to thirty-five feet, and down near the river you can get it within four to six feet. I don't know that the underflow near the river rises and falls when the river is up or down. I never paid any attention to it nor ever noticed it in an open well, and don't know that right here at the water works well the water rises and falls according to the condition of the river. When they dug the railroad well they dug that and we can see the running water. That was about fifty feet across when they dug it. It is right here by the depot. It must be three-quarters of a mile, or maybe half a mile, from the river, straight down. Yes, sir, you could see the water running across northeast, about the same direction as
5936 the channel of the river. Yes, sir, it was so noticeable that it caused comment. All the people of the county went there to look at it in those days. Oh, yes, they would throw chips in and see them float right across off northeast. Yes, they would do that, and I saw them do it. I don't know whether that is true today or not I know of no reason why it should change since that time. No, I have no definite idea of the velocity of that current, but at that time I thought it was about the same as the river or as the river water running. Yes, those chips or anything that we would throw into that well would float across there fast enough so that you could see a perceptible movement. And I think others saw that, yes, sir. It was a notorious fact, and people looked at it. I don't know whether the water in that well became higher after the river had been up a number of days. My attention was never called to that. My impression is that that well was about fifty feet in diameter; it was a round well.

Redirect examination.

By Mr. DAWSON:

5937 I think this well is about 200 feet east of Broadway, which is the main street running north and south through Larned,
5938 and the river by Larned runs a little north of east. The current in this well was from the southwest to the northeast.
5939 The Pawnee empties in a little west of the bridge over the Arkansas river at a point due south, and nearly due south of this well, or a little west. If you should draw a line in a southwesterly direction from the well it would strike the Pawnee before it struck the Arkansas.

No, sir, it is not a fact that when the bridge was originally built

up about Garfield, of which I spoke, that for the sake of saving bridge construction the road was, by a fill, carried out into the river on each side—and now I am referring to the first bridge. It was built clear out over the south bank. While I was not there, by judging from the rip-rap or protection they made by the bank of the river on the north side, they didn't carry a grade out into the river there. It is now graded about where it was when the original bridge was built. On the southeast end of that bridge it has

5940 been narrowed where that made land is. As to what caused that made land, as the old saying is, God made everything, and I suppose He designed it that way, but the ground was a sand bar, and it grew up with brush. No, sir, I don't think there was any artificial means used to help make this land, but I don't know. As to whether it is true that along the river where there is a good deal of made land parties owning the land abutting on the river have aided nature by shutting off little channels and planting trees and various other things of that kind, I would say they never do anything of that kind except on this side of that Athey piece a man by the name of Fraley, who owned the island where the Pawnee comes in, undertook to make a dam of wire and sacks, and Athey brought suit in court to stop him.

5941 Yes, sir, I know the Dunawa ranch, and I know there is made land there, but I don't know that this land was made by artificial means. I never knew of his doing anything of that kind. He does a good many things at night, you know, that we do not know of; that is, all of us do things of that kind at night. No, sir, I have never owned any lands along the banks of the Arkansas river in this county, and I have only had occasion to make trips up and down the immediate banks of the river in late years, just to follow the roads, that is all. Sometimes that would be a mile from the river and sometimes right along the bank of it.

5942 As to whether the road was carried out into the natural channel of the river by filling, at the north end of the bridge that crosses the river where Main street strikes it in the town of Larned, I would say I think not. When that first approach was built it was built near the bank on the north end of the river—the north bank of the river, at the north end of the bridge. I think the length of this bridge is now about the same as it was originally. The one at Garfield is shorter, I think, by about 400 feet, and that is on account of made land. There is a good road right up to there, right over that, now. As to the bridge one mile below Larned, that is divided. That bridge is lengthening all the time.

5943 Yes, sir, the Arkansas river through Pawnee county is and always has been a shifting river that cuts first on one side and then on the other, and any obstruction will change the current of the river and when the current is changed this shifting process in the bank goes on, yes, sir.

Yes, sir, the town of Larned is in the valley of the Arkansas river. This valley has what we call three or four levels. The first, down

next to the river, is lower, and then it rises four or five feet, or three or four feet, and then it runs back and rises again, and then you strike the hills or the bluffs or uplands, yes, sir. Yes, even when you go clear back to the bluffs and on the uplands you will find living water. No, sir, so far as my experience goes I know of no place in this county which is not underlaid with water that can be reached.

Recross-examination.

By Mr. ASHBAUGH:

As to what caused the Garfield bridge to shorten, I will say it is the made land on the south side or south end of the bridge.
5944 My version of it is that it formed first and made a sand bar and then the trees and brush began to grow there, and as soon as they got in they kept the water from washing that sand away. I don't know how long ago these sand bars and islands began to form, but I would think it was all of ten or fifteen years, and it was ten or fifteen or twenty years ago that the trees began to grow along there. (Objection.) There were not many trees along here twenty years ago. When I came here first there wasn't any, and practically there wasn't any ten years or so ago. If you
5945 should draw a line from the Santa Fe well at right angles with the river at its nearest point, the mouth of the Pawnee would be near that line. (Objection.)

Redirect examination.

By Mr. DAWSON:

As to the difference there is in the level of the water as shown in that open Santa Fe well about which I have testified and the level of the water in the Arkansas river at the nearest point, I would say I don't know. Of course I would have to guess at that, but approximately, I would think about ten or twelve feet. That is, when the water was running in the river the water in the river would
5946 be higher than that in the well. No, I didn't mean to say a moment ago that the water in the well was seven or eight feet higher than the water in the river. I understood counsel for complainant to mean the bank of the well and the water in the river at that point—that the water in the river was apparently about seven feet lower than the bank of the well here. Yes, I mean to say that this well down here is only seven or eight feet higher than the bank of the river, and it is on the second bench. Now, as to whether the second bench is only seven or eight feet higher than the bank of the river, I would say I never levelled it through, but don't believe it is any higher than that. I think it is about that difference between the bank and this bank here. Yes, it was the river bank I had reference to.

Recross-examination.

By Mr. ASHBAUGH:

Yes, when the water was running in the river the level of the water in the well was lower than the level of the water in the river, and that well is about three-quarters of a mile from the river.

5947 Yes, sir, I know something about the salt well near town here; it is located just west of Main street and north of the Pawnee river, near the bank. It was dug, I think, about 1887 or 1888. As to what effect the digging of the salt well had upon the other wells in the town that were located near it, I will say, all the wells that are on the level, that is, away from the hill, have been destroyed, and it affects the water for a mile or two miles below town. It does not affect the water of the underflow above the well or up the river, no, sir; it only affects the underflow below or down the river from that well, that is all.

GREAT BEND, KANSAS, May 5–6, 1905.

5948 GEORGE N. MOSES, Great Bend, Kansas.

Direct examination.

By Mr. DAWSON:

I live at Great Bend, Kansas, and have made my home here since 1871, with the exception of 1879, 1880, 1881 and 1882, when I lived in Colorado. I am engaged at the present time in the ice making business, manufacturing artificial ice for the con-

5949 sumption of the people here in the city. Yes, sir, since I have lived here in this county I have been sheriff, county commissioner and also mayor of the city of Great Bend.

I am familiar with the Arkansas river, and have been since I have been living here. It is just about a mile, practically a mile, from the town. This town is in the valley of the Arkansas river, yes, sir. As to the average flow of the Arkansas river for an entire year, not taking particularly into account any dry month or wet month, over a period of four or five years so as to wipe out any drouth year, during the last five or six years as compared with a like number of years in the '70's or '80's or both, I would say for the past ten years I would think there has been more of an average flow than

5950 there was previous to that. That is, there has been a continuous flow in the river that would make the average greater. The average flood waters, I think, have been lighter than before the country was broken up. Yes, sir, I mean that the flow of the stream has been somewhat equalized, not reaching such extremely high points, as a rule, nor such extremely low points as a rule. A better average, yes, sir. For practical purposes as a river running through Barton county, I think the Arkansas river is now and has been for

he last ten years as good a river as for the first ten years. Yes, sir, I think it has. (Objection.)

Yes, sir, I have known ever since I have been here what is called by the people here the underflow or ground water, and that there was such water underneath the surface, and as to the depth that it is necessary to go for water here at Great Bend, it varies on this ridge that we call this high ground through here. We are about on the apex. Take it right through on the center of this, it
5951 is from twelve to fourteen feet to water, and as you go to lower ground it is less. It runs down to two or three or four or five feet.

Yes, besides being in the ice business here I have spent most of my time in the hardware and implement business, and that business brought me in contact with a large number of the farmers of the country, yes, sir, and my acquaintance in that capacity and as sheriff and county commissioner was general with the people of the county. (Objection.)

As to how the level of the ground or sheet water underlying the surface of the ground here in the valley of the Arkansas river compares with what it was in the earlier years, I would say that it is about the same.

As to whether I ever heard the farmers of this county in the valley of the Arkansas river prior to the commencement of this suit complain that their lands were being made less productive or less valuable by reason of the subsidence or sinking of the ground water (objection), I would say I don't call to mind that I ever heard
5952 any objections. As to the crops raised in the valley of the Arkansas river in this county in the last five or ten years compared with the crops raised in another like period prior to that time, I would say the average is better now.

As to the values of farm lands in this valley in Barton county compared at this time with those of previous years, I would say that lands are selling now very much higher than they were in previous years, and this county is now in a more prosperous and growing condition than it has ever been, yes sir; that is, it has been for the past few years.

Cross-examination.

By Mr. ASHBAUGH:

Yes, sir, I came here in 1871. No, sir, I don't think the river is as wide as it was when I came here, on an average, through
5953 the county. In places the river banks are grown up with trees since I came here, and there is a good deal of made land along the river on both sides through this county. Yes, sir, I think, beginning with 1902 and ending with 1903, the flow of the river, exclusive of flood periods, is greater than for the first ten years after I came here. I wouldn't be positive in regard to the flow in 1893. As to the flow of the river in the fall of 1903, I couldn't an-

swer whether there was any water in the river or not. I don't remember in regard to that. I don't remember positively of 1903 in regard to the river that fall. I don't remember now that I saw it in the fall. Up until 1902, from 1895, I saw the river almost every day. Right here opposite Great Bend I think the
5954 banks have narrowed possibly 200 feet. The original river bed right at that point was at one time over half a mile wide. I don't remember any flood lately being as great as they used to be in the early days. We used to call those floods June rises, and it was understood that it was caused from the melting of the snows in Colorado. They came along in June. Sometimes it would last a couple or three weeks and sometimes less and sometimes more. They would usually come suddenly. It would fall very quickly.

Yes, I remember 1879 was a pretty hard year here. It was a poor crop year—a drouth year. The climatic conditions were bad.
5955 We had no rain. No, sir, I don't think there was any water in the river that year only in flood seasons. 1879 was the poorest of the three years right along there.

The depth to the water a few hundred feet back from the river on the first bottom lands will vary all the way from two to six feet in places. It don't vary a great deal at one time of the year as compared with another time of the year. Yes, right close to the river it varies quite a little after the river has been up or down for a long time. What we call the underflow here is a sub-stratum of water. It seems to be a sheet of water, though apparently it was all through the bottom here. We struck it at about the same depth. As to
5956 why it was called an underflow (objection), the opinion used to be with most of us—I know it was mine—that it was seepage water from the river, and that is the reason we gave it that name. I don't think it has ever made any particular difference in the crops on the first bottoms. We raise principally wheat here on the first bottom. Yes, sir, Barton county is now considered one of the best wheat counties in the State. It is really the only sure crop we have.

Land values have gone up here lately on account of the big crops of wheat. Ten years ago Barton county was not considered one of the half dozen great wheat counties of Kansas, and today it is. During the last eight years it has been coming right to the
5957 front, and wheat is now our principal crop. Some years we raise very good corn, but it is not a sure crop. No, sir, we cannot rely upon a corn crop at all like we do upon our wheat crop.

Redirect examination.

By Mr. DAWSON:

As to the level of the ground water close to the river being affected by the stream rising or falling, I would say that I noticed that more particularly. I used to live for several years right within 400 yards of the river. I dug a cellar under my residence and had it walled up,

and I noticed it every time the river came up. Every few days after the river came up there would come from one to two or three feet of water in the cellar, and as the water would go down that would go down. Yes, there were evidences that in the earlier times there had been an old channel of the river through what was the low land in the vicinity of the river. When I first came here there used to be one channel than ran half a mile farther out to the south; there used to be another one that cut out through three or four miles above here and came down where that patch of timber
5958 is now and emptied into the river just above the stockyards. There was a channel that went right through at my house then. Whenever we had high water the water ran through there so as to swim a horse. We had it in some years there when the water running on the surface came up very close to the house approximately about fifty feet, something like that.

I understand that there have been some levels or something of the kind run that have proven that this underflow or ground water throughout the valley is not furnished by the river, and that is different from the opinion that used to be, that the river furnished this underflow. That has been my opinion, as I stated, and I always supposed that was the case, because in driving wells we would drive them anywhere in this valley and we would apparently strike this water on the same level. I had never made any survey or anything of that kind to know it was not, but it was a supposition with me, because we found the water on what appeared to be the
5959 same general level, although we never actually ran any levels. That is about the same. Even if you get back out of the valley entirely and dig deep enough you will find the general level of the sheet or ground water. That is why I supposed it was seepage water from the river; but as to making any real investigations or expert inquiries or running any levels to find whether or not that was the fact, I never did, no, sir.

As to the river having been narrowed up through Barton county by artificial means, such as the planting of trees or the stopping off of little currents so that a man could attach an island to his land and have a little more land, I would say, yes, sir, there has been some work done in that respect. One thing that has narrowed it up here, they took two bents of the bridge off and filled it in there, making a sort of jettie, and of course that would narrow it some, but there are some places that have filled up naturally. There are no places that have widened naturally by cutting that I know of. Possibly there are, but I haven't paid attention to that enough to know.

As to the effect of the narrowing up of the channel, if any, in the way of scouring out or deepening the bed of the river, well, sir, I don't know whether it is any deeper. I haven't observed that closely, but I know it would naturally cut out. (Objection.) Yes,
5960 sir, the bed of the river is very loose sand—all sand. (Objecton.) And the character of the river where it is let alone in

its natural condition is that the channel changes, and that has always been true, yes, sir. Sometimes the deep channel would be on one side of the river and sometimes on the other, and sometimes in the center.

Recross-examination.

By Mr. ASHBAUGH:

Yes, sir, there are islands in the river that have grown up since I have been here. I will qualify that somewhat. I don't remember positively whether they have grown up. There is quite a number of islands, though, that have disappeared, and I think some have grown up, too. Yes, some of those islands have grown over with
5961 trees, and then there are some below here, quite large islands, that have been washed away, and have disappeared. Oh, no, sir, I didn't mean that the record should show that the water in my cellar flowed in over the surface at all. It was seepage water from the river, yes, sir, and that was true of the other cellars in that part of the city, yes, sir. I moved away from that place in 1886 or 1887. Whether that cellar has had any water in it since that time, I don't know. I sold the place and have never paid any attention to the cellar. I couldn't say whether the cellar has had any water in it in the last ten years prior to 1904. I don't know whether there are other cellars down there that had water in the earlier years and have had no water in them in the last few years. I haven't heard anyone speak anything about it, and haven't had occasion to notice anything of that kind.

5962 W. B. NORRIS, Great Bend, Kansas.

Direct examination.

By Mr. DAWSON:

I live at Raymond, Rice county, Kansas, twenty-one miles from here, and have been living in that county three years. Yes, sir, I lived in Barton county before going to Rice county. I came to Barton county in 1879 and continued to live here up until three years ago. While living in Barton county I lived at a place called Claflin, which is twenty-four miles northeast from Great Bend and about ten or eleven miles from the Arkansas river.

5963 I have been acquainted with the Arkansas river twenty-five years. At the present time my farm adjoins the river. When I first saw the Arkansas river it was dry. That was in 1880, in the early part, and the point at which I saw it dry was about two miles east of Great Bend. I was along the river near Walnut creek, and when I saw the river then there was actually no running water for five or six miles. Yes, sir, I saw it dry again in the earlier years. From 1880 on, say for ten years, I think it was usually dry outside

of flood periods during certain times of the year. They usu-
5964 ally had a flood in June. Yes, sir, I have known the river pretty well for the last few years. When I first knew it I only saw the river occasionally, but in the last three years I have seen it practically every day, and I have never seen it dry in the last three years. (Objection.)

Yes, sir, I have had occasion to know what is called the ground water or underflow through the valley of the Arkansas river, and as to how the water level of the valley of the Arkansas river in this county and Rice county compares now with the level of the ground water in the same localities when I first came to the country,
5965 I should say it is practically the same. The only time there is any change is within a short distance of the river. If the river comes up the water comes up, within a short distance of the river, and when the river is up the water will seep up through the ground, when there is a flood on, but when the river is at its normal stage it is the same level now that it was twenty-five years ago.

As to the farming lands in the valley of the Arkansas river in the part of Barton and Rice counties which I know, as to productiveness, compared now with what they were in the earlier years, I would say they are better. Why, the crops are much better in the last five years compared with any other five-year period previous to that time.

As to the value of land up and down the valley of the Arkansas river in Rice and Barton counties at the present time as compared with what it formerly was, I would say it is higher.

5966 Yes, sir, I had a general acquaintance with the people of Barton county when I lived here, and I know a good many people, and I have an acquaintance in my own locality in Rice county, yes, sir. Yes, I have been township clerk in Claflin, Barton county.

As to whether I ever heard any of the farmers or people complain prior to the commencement of this suit that the value of their lands had been decreased or their productiveness lessened by reason of the lowering of the ground water or underflow (objection), I would say no, sir.

Cross-examination.

By Mr. ASHBAUGH:

Yes, sir, I located in Independence township, where Claflin now is, in Barton county, in 1879, and lived there down to September, 1902, when I moved down to Raymond. Claflin is about
5967 twelve miles straight north and some east of Ellinwood. Ellinwood is fourteen miles from Claflin and about five miles west from the east line of Barton county.

Yes, sir, my knowledge of the Arkansas river in the early years was gathered while I was living there at Claflin. I never
5968 lived in the Arkansas valley or upon the Arkansas river until 1902, and I was comparing the early flow of the river

with the later flow with what knowledge I have of it, yes, sir. All the knowledge I got was when I saw the river. I was a farmer up there at Claflin part of the time, and was in the mercantile business. Yes, the idea I got when I was living up there was that the river was dry practically eleven months out of the year. That would be the conclusion that I would draw—excepting when there was a flood in June. That was when I was living fourteen miles from the river.

5969 Yes, land is more valuable in the State now than it was ten years ago, because it produces more and pays a better percentage on the money invested. I don't think we have any better farming now than we did twenty years ago. The country is a good deal better developed in some respects. Yes, there are better markets.

My land now adjoins the river, and as to how deep down you dig for water depends upon what place you dig in. In some places it is probably a foot or two, and when you strike higher ground it will be farther. It will depend on how high the ground is. There are some hills there that probably are twenty-five feet high, perhaps.

I have 1,900 acres of land. Probably 300 acres of that is
5970 first bottom land. On those first bottoms I raise brush mostly. Yes, it is too low for good farming land. And that is the reason I am up here, yes, sir. On the second bottom lands I raise hay, and if it is high enough we crop it. By "high enough" I mean if the ground is high enough above the sheet water. Yes, close to the river the underflow depends upon the amount of water in the river. I am not prepared to state exactly how far back, but I have observed it about half a mile. That is the farthest I have ever noticed it. Yes, it depends upon the amount of water in the river. It follows the level of the water in the river. When the river is up the level of the underflow is up so as to correspond with the river, and when the water in the river is down it goes down, yes, sir.

Of this 1,900 acres of land that I own, I probably raise crops, either hay or plowed crops on 700 acres, and I farm the places myself; that is, it is under my supervision.

5972 FRANK GIBSON, Great Bend, Kansas.

Direct examination.

By Mr. DAWSON:

I reside in Raymond, Rice county, Kansas, and that county adjoins Barton county on the east, the next county down the river. I have been on the place I am now on since 1883. My place is just about a quarter of a mile—it lacks that much of going up to the river. My house is a little over eighty or maybe ninety rods from the river.

The first time I ever saw the Arkansas river was in 1863, I guess. I am sixty-four years of age now. At that time I was in the regular army service. Well, no, it was in the First Nebraska. It was a Territory then, you know. I saw the Arkansas river first close
5973 to old Fort Zarah here about three or four miles east of town, and we struck it along about the last of August, as near as I remember, and there was not any flow of water in the river at that time. After being at old Fort Zarah we went back to Fort Kearny, on the Platte, and the Platte river was dry too. No, sir, we were not back on the river any more that year. The next time I saw it I moved to this county thirty-one years ago the first of this month, to this town. I was out here in the fall before that and took up a claim six miles west of the town, and I located there, six miles west and a mile north. That was about four or five miles from the river. I lived there until I went to Greenwood, but didn't stay there but one season when I came back to Rice county. I
5974 haven't been away from here a whole year since I settled here thirty-one years ago, and I have been engaged in farming and threshing altogether since. In threshing I went from place to place and from farm to farm, yes, sir. Mr. Miller and I threshed in this county I think nine years, and I then ran one season in McPherson county and one in Ellsworth county. Yes, in threshing we would be brought in contact with a large number of the farmers along the Arkansas valley. We ran the steamer pretty nearly all the time, and our water supply was the main question with us.

Yes, sir, aside from the year 1863 when I saw the river dry I have seen it dry at other times. Well, there would be water in holes, probably, but I have seen it dry—in places it would be dry where it wouldn't in others. From Kinsley down to the mouth of the Pawnee up here it was dry—four years I guess it will be this summer. But from Larned down to Raymond there would be some running water in it. Yes, it was dry in those years, 1879 for instance, and 1880, but I don't remember whether it was clear dry that season or not. It was very nearly dry if it wasn't. As
5975 to the habit of the river in the first fifteen years I was here as to going dry at certain seasons of the year, I would say it would generally go very low in the fall, along from 1874 up to—unless it was once in a while a wet season like this, rains in the mountains or something that started it earlier, it would come up along in May and then work down until you could wade it without any trouble in the fall. As a general thing once in a while in the fall the river would be harder to ford.

From my observation and experience with the river for the last thirty-one years, and comparing the flow of water in the river for the last five or six years with periods of five or six years in the early times, I would say there has not been such a great deal of difference in it only in May. In May and June, the fore part of June, it is generally higher—it was higher in the earlier years than it has been of late years. I think the average flow in the river the year

round will average very nearly as good as it used to. No, it
5976 doesn't get quite as high in May, and it has never been dry since I have lived down at Raymond, that is, opposite my place. There has always been some running water in it there. (Objection.)

Yes, to a certain extent I have heard of the ground water or underflow as it is called in the valley, and as to its level throughout the valley of the Arkansas river through the country with which I have been familiar for thirty-one years, compared now with what it was in the earlier years, I would say I haven't had so much experience with the drove wells until the last twenty-two years. Up here I have a dug well. But it was affected once in a while by either—this well up west of town here—the big well—sometimes the water would rise a little in it, but very little. In the twenty years I don't think it has varied a foot in my place. I drive my wells down there and move them every once in a while, and cut the pipe the same length for all of them. It is nearly level, you know, back, and I aim to dig down to the level of the underflow to set my cylinder so as to get it below the frost. That is three to five feet, and I put ten or twelve feet of pipe on below, and in testing the depth of the water in the pipe before I put my pump on I have found but very little variation in it. I have driven thirty-
5977 four pumps and have to take some of them up every once in a while and change the points, you know, and move them.

As to having ever heard any of the farmers in Barton or Rice county in the valley of the Arkansas river before the commencement of this suit complain that their land was being damaged or made less valuable or productive by reason of the underflow or ground water seeping or getting lower, I would say no, sir, I have not. (Objection.)

As to the crops per acre on the same lands in Barton and Rice counties in the valley of the Arkansas river in the past five years or ten years compared with the earlier years, I would say that with the exception of 1878 they have averaged better of late years. As to any change in climate or the way in which our rains come, I would say they don't seem to come as heavy now. I don't
5978 think there has been but very little variation in the amount of water that falls, but it has been more even and better distributed in the last five or ten years than it used to be. No, it don't wash and pile the sands around it like it used to.

Cross-examination.

By Mr. ASHBAUGH:

When I struck the river in 1862 I stayed just a day or two. I was just a scout, you know. I don't know how long the river was dry. I know the Platte was dry when we left it and when we got back. I was gone probably three weeks. I lived on my place northwest from Great Bend from 1873 to 1881. Yes, sir, I had a big well

there, and I could see how deep it was to the water level. Yes, sir,
I think the water level would respond there to the condition
5979 of the river. It would vary a little at times. When the
river was up my well would be up, but whether it came from the creek or river I don't know. I was right on Dry creek west of the town. Yes, that was in the valley of the Arkansas river and five miles from the river. When I put down a drive well I always test the level of the water just before I put my pump down to find out how much water I have got. I got fooled a good many times by getting mud into the pipe and not knowing when I had water. But I almost always run something down to test the water to know whether I have got water enough or not. But after my pump was put on, no, I can't see anything about it. Yes, sir, a drive well is just a pipe driven down with a pump on it. We strike some stratum that is a kind of gumbo, where there is no gravel. Yes, sir, I think the level of the underflow corresponds down where I live with the level of the water in the river. I think it runs right along, too, very nearly to the level, but as the underflow gets back—now, the river, it would be like it is now, and when it gets up it takes it a
long time to get back in. It is slower than a fellow would
5980 think. It goes down very gradually and rises very gradually.
It doesn't crowd back fast. I have dug down and screwed my pump on, and say along at this time of the year when the river is up I would have to take it up, and sometimes the water would be so high that I couldn't unscrew it. The water would be up so that I couldn't take my cylinder off on account of the pipe filling up with the sand and gravel. Yes, sir, that is about half a mile back from the river. Yes, sir, the majority of our wells down there are about half a mile or a mile from the river. As to how far back the underflow extends from the river, I will say I have pipes a mile from the river, on the south side of it, and it will rise in them sometimes when it is up long enough. Yes, sir, there are some sloughs down in Rice county that have water in them when the river is up and that are dry when the river is dry. I have noticed that only where it would seep up. If it stays up a little while it will rise. It will rise in my orchard if it stays up long enough, and that orchard is
about eighty or ninety rods from the river to where the water
5981 comes back. If the river stays up a number of days or weeks
then the water will rise up until it stands on the surface of the ground in my orchard. You can see it a long time damp from the top where it will come through. Sometimes it never gets to it. It didn't get to it this time at all. And after the river goes down and has been down for a time the water will go down in that place along them old channels. Where my place is it has all been channel some time. I don't think it rises and falls back on heavier land at all like it does there.

Yes, sir, I have been threshing the last few years. The wheat is grown on the upland and second bottom, and some of the best wheat we had in the last season was on the first bottom. Yes, in

some places, however, the first bottoms are too wet for wheat, but in some places it runs up nearer the river than others. In some places it runs right up to the river. I own half a section of land that runs right up to the river that had as good wheat last year as I saw in Rice county, but it was higher than some other lands.

Yes, sir, I know the land that Mr. Norris owns down there. A good share of his land is pretty low. He has one quarter, and I don't know but pretty nearly a section. No, you can make
5982 hay on most of it, except where there is too much brush, and there is brush over it along in places—mostly willows and cottonwoods.

Yes, the water shows in some bayous around in my land when the river has been high. Yes, there are evidences of old channels which at times have been occupied by the stream, I think, clear across from the river to where I live, which is a little over three miles. It has all been river at some time. The channel is cut around in different places and these holes or low places in which the water shows are along the line of these old channels, apparently. They are along there.

As to the banks of the river being narrower from here down to Raymond than they used to be, no, sir, I don't know as they are, on the average, unless it is where there has been a grade put in for a bridge or something like that. Oh, yes, there is lots of
5983 made land along there on either bank of the river between Great Bend and Raymond in places where it has growed up, you know, and this muck catches up on the sand. Close to our bridge we put in 400 feet of a grade, and that is filling up above the grade. Oh, yes, there are lots of little islands between here and Raymond. I don't know how long they have been formed. There have been islands there ever since I have seen it. Some of them have grown up to trees now and some had big trees on them years ago that have been cut off. Yes, some of the islands are getting larger and some are getting smaller. They get smaller whenever the current sets in in their direction and hits them, during the floods. Yes, the islands formed in there during the dry season of the year and some of them washed out during the flood season. That is just about it. I have got a telephone pole set on a little island and when the island was cut in two the pole was about washed out. That bridge that I spoke of was about eighty rods south
5984 of Raymond. That bridge was 900 feet and we shortened it it up 400 feet. I don't know what they did that for. The commissioners did that. I didn't have anything to say about it, but I suppose they thought it was cheaper to make the grade than to make a bridge

5985 ROBERT A. BIDLEMAN, Great Bend, Kansas.

Direct examination.

By Mr. GREGG:

I reside near Great Bend, Barton county, Kansas. I am a farmer and came to this county in March, 1878, and have been farming from that time to the present. My farm is about four miles south of Great Bend. It is on the south side of the river, and the eighty acres that I now live upon is about a mile and a quarter from the Arkansas river. I have been farming in that vicinity ever
5986 since 1878. Eight years ago I moved onto another farm nearby. The land that I farmed is what is called second bottom. I have been over the lands there which are called the first bottom and have seen them frequently since those early days. My land doesn't extend into the first bottom. Ever since those early days I have been up and down the river frequently.
5987 As to the flow of the Arkansas river in this county during the time I have resided here, it was dry in spells and sometimes there was a little channel of water. This usually occurred in the spring of the year, at the time the freshets would come. Sometimes that would be in May and June. Then in the fall of the year we had these hot, dry winds. I have crossed it when there was no water in the river at the time except in little holes. The river did run dry in those early days. It did so at intervals. Sometimes there was water there in the river and sometimes there wouldn't be. I couldn't say whether or not it was a matter of common occurrence in those earlier years. I have seen many years there when there was no water in the river at times. Lots of times when I would go across the bridge I wouldn't take notice whether there was any water or not. I would always have to go across the bridge when I came to town, and sometimes I have driven across the river in coming to town when there would be no water. In those early years I saw it dry more than once. It occurred quite frequently.
As to the flow of the stream in the river during the last three
5988 years as compared with those earlier years, I would say there has been more water, that is, taking it the year through. Leaving out of consideration the high floods or high waters in the Arkansas river in this county, from my observations of the flow of the stream in these early days as compared with the last ten years (objection), it is a hard question for me to answer because I never took much notice of the river. Taking it in cycles of eight years at a time, and beginning with 1878, I would say there has been more water flowing in the Arkansas river in the last eight years
5989 than previously; that is, as compared with the earliest eight years. I don't think there was much change between those earlier years and the later years. There has been more water in the river in the last three years than in those earlier years. That ap-

plies to the dry season of the year here in the river. Of course we haven't had any very dry season in the last three years. Taking it in the fall, the flow of the stream in the Arkansas river here along late in the summer and fall months has been as good in the last three years as during the same season in those earlier years.

5990 In addition to farming, I also used to run a threshing machine. That was from the '80's up to 1898. In that business I was all over down south there through that country, in localities. In some years I would get out of my neighborhood ten or twelve miles, and in so doing I met the farmers there from the east and west and south. I threshed also for farmers near the Arkansas river, and I have seen those farmers during all those years.

In coming in contact with all these farmers during all that time, I have never heard any of them complain to the effect that the water level had been lowered so as to hurt their crops or their land. Of course they might have complained to others, but they have not to me. (Objection.) There was complaint among the farmers

5991 about the overflow of the river; that is, it drowned out their crops. That was on the bottom land, right along adjoining the river.

As to the crops raised on my land and also on the land in that vicinity running down to the river and up and down the river, and comparing them with the earlier years, taking say the last seven or eight years, the crops have been better in the last few years, taking it on an average, than they were before. In 1892 we had a

5992 good crop, and then from that up to 1897 we had failures, of course, in dry weather. These failures were occasioned by dry weather and lack of moisture. I never heard anyone complain to the effect that any lands in that vicinity had been injured by the lowering of the underflow.

Cross-examination.

By Mr. ASHBAUGH:

I call it the underflow because I have always heard that. If the underflow should be lowered two or three feet permanently,

5993 as to whether that would benefit the land through Barton county, why, I couldn't say, because I have never, honestly, taken any notice of this underflow water or the rise of the water. (Objection.)

There is no swampy land in Barton county like we had in the east that has to be drained, none that we call marshy lands along the river banks that I have been on, no, sir. The reason I say there is more water in the river in the last two or three years is, why, going across there off and on there has been mostly a channel of water in there. Yes, it is because there are more rains here in the last three years, and probably there has been more snow in the mountains. As I say, what we count on is more snow from the moun-

tains. (Objection.) We look to that for freshets along here in May and June.

5994 Yes, there was a period of drouth from 1892 up to 1897, and the river was dry in spells and there was no water in it. Of course that takes me back a good ways, and for a person who has paid no attention to it—— I have paid attention to it only here lately. Now, take it a year ago here this last winter, I have been crossing the river off and on and there was a channel of water then most of the time. Last year was a very wet year and there was a good channel of water most of last summer, except one time it was nearly dry. Why, if there was a good channel of water coming down during August, September and October, the condition of the lands in Barton county along the river would probably be better. That would be a hard thing for me to say, because it is on this higher ground, unless you claim that the creek or something like that would have a tendency to draw the rain. Of course then it would be.

5995 The wheat in Barton county is raised on this upland almost exclusively now. Of course on the north side of the river we raise wheat mostly, but take them three townships on the south side of the river, they raise considerable corn too.

During those early years, as to my having a definite recollection of the river, well, I know there are some times when I would go across there—I know I have crossed that river many times without getting the soles of my shoes wet. Oh, yes, I can remember when there was water in it as well. I am not saying but what there have been channels of water going through there, but of course I claim it has been dry too.

As to what interest I have taken in this case, I have no interest in it whatever. I am a Kansas man from start to finish. I can't say how the Colorado attorneys found me out to testify in this case. They came out there yesterday afternoon and asked me the questions you gentlemen are asking me here today. I answered them the best I knew how. I didn't know I was going to be subpœnaed.

5996 As to the underflow and its rise and fall with the amount of water in the river, I couldn't say, because on the ground there you see—— The land that I farm, the underflow has no influence on that land, no, sir. There are probably people living right there in that bottom that could answer the question better than I could. There is one man here who will be on the witness stand that lives right there on the bottom. (Objection.) No, there is no land on the bottom there that is marshy except in wet weather. The bottom lands are mostly used for hay land and pasture, but when we have rains like these we had here last harvest, of course they can't go in on that bottom land and mow hay or anything of that kind. That would be the moisture from above, though, coming down from above.

There has been a great deal more rain during the last three years than during the '90's. It mtght be that I judge the condition of the river to quite an extent by the rainfall here.

5997 L. D. WILLIAMS, Great Bend, Kansas.

Direct examination.

By Mr. GREGG:

I am fifty-eight years old. I am a farmer and live in Barton county. I got my first land in 1878—homesteaded it. I took up eighty acres. That land is about two and a quarter miles east of Great Bend, and the north line of my land is a little over half a mile from the Arkansas river. My land is on the south side of the river, and I have been farming all these years, from the time I took the land until now. They call this land which I have first bottom.

5998 I am well acquainted with the flow of the Arkansas river in this county and have noticed it from the early days. As regards the amount of water in the stream, there was quite a little stream flowing there for the first year or so when I came in 1878, and it kind of dwindled down, and I think it went dry somewhere about 1879. During those early years when I was living there the Arkansas river didn't go dry frequently; it went dry two or three times I suppose. It has been quite low. It would always go low along in the fall. I also rented other land in the next section east. That land runs down to the river. That was first bottom land. I had that land along between 1880 and 1890 and had it for a number of years.

5999 In reference to the flow of the Arkansas river in this county in those early years as compared with the flow in more recent years, say during the last five to eight years, we have more now than we had eight or ten years ago. There is more water flowing. And that is also true during the fall of the year. As to the flow of the river during those early years and these late years, I would say there is more water flowing now than in those early years.

I have hay land on my place on which I have cut hay off and on all these years. I have got twenty-seven crops in twenty-seven years. I have never noticed any change in the amount of hay produced there on that land during those years. It is just as good now as it ever was. The rest of my land was pastured, outside of my garden truck patch, and the rented land was in meadow and corn. On this rented land the crops, as compared with the earlier years, are even better, and the crops upon the lands in the vicinity of my farm, as compared with those earlier years, are better.

6000 Yes, I am well acquainted with the people up and down the river, especially the farmers, say for eight or ten miles up and down the river. I have never heard any complaint from any of those farmers to the effect that their crops or land had ever been hurt or injured by any falling or lowering of the water level in that country.

Cross-examination.

By Mr. ASHBAUGH:

Yes, sir, I think there has been more rain in this country in the last two or three years than for a number of years during the '90's. No, sir, I do not judge of the water in the river by the amount of rainfall. (Objection.) I judge from the mountains—the melted snow.

6001 As to the number of years there has been more water in the river than there used to be, I should say, oh, seven or eight years, probably. Probably a little longer. I haven't kept any special record of it. I don't know that the snowfall in the mountains has increased. As to that increase coming from the snow falls in the mountains, I say I think there is more water in the river, yes sir. Well, last year, and this year so far as it has gone. (Objection.) No, I am not judging it from last year

6002 any more than this or years previous. I don't know whether they had more water in the river last year than in the year previous or not. I couldn't exactly say whether there was more water in the river last year than three years ago; that is, as to the difference. There may have been a little more and may not have been. No, sir, I guess there was no more water in the river last year than in any one year five years ago, so far as I know. We may have had, but then I don't know it. Yes, I have cropped my hay land every year. I can't see that hay is any better one year than another. It is just about the same. No, sir, the crop doesn't

6003 vary according to the conditions of the year; that is, if it does I can't notice it. There is always a good crop whether it is dry in this country or whether it is wet, yes, sir. Yes, sir, just as good a crop in a dry year as in a wet year. As to whether the rain has anything to do with my crop, I would say I can't tell you about that, but I get the same amount; that is, if there is any difference it is so little that I can't notice it. And the same quality. There is no difference in that that I can notice. It is just as good in a dry year as in a wet year, yes, sir. I couldn't tell you where it gets its moisture. Yes, sir, there have been years since I have been farming down there when the crops in the county were poor. As to what caused that, I say the want of moisture, I presume. But those years I had good hay crops, yes, sir. Yes, I have good hay crops on my bottom lands when I have failures of crops on the uplands. That is a fact. On the uplands back from the river

6004 they raise different crops, but mostly corn and wheat—mostly wheat, though. Over my way they raise lots of corn on the high lands. I don't know why it is that they get a good crop of hay when the other crops fail because of drouth, but then it is the case.

It is about three to five feet on my bottom lands to water. As to whether that water is ever nearer the surface under my hay lands at one time than at another time, I don't know. Take it in my

meadow, it is a little different than it is in the pasture. It seems to be a little higher in the pasture, and that is where I have dug wells and post holes. Take it in the meadow, there seems to be less distance to water than up higher on the hardpan. As to its ever being deeper to water in the same place at one time or one year than it is at another, I can't notice that it is any deeper. I have never noticed it. No, as to there being any difference in my meadow whether the river is up or not, as to the effect on the depth of the underflow, I would say it never has yet.

6005 If the river could be as high for weeks as it is now, as to the underflow in my meadow being any higher than though the river had been absolutely dry for months, I will say if it did I wouldn't feel the effects of it, at least I never have yet. No, sir, I have not noticed it. Well, no, I haven't paid any particular attention to it in the post holes. No, sir, there are no pools or little hollows where the water stands from the underflow down that way. Yes, sir, there are places where the water stands on the surface, and as to where it comes from, I will say from above, I guess. Yes, all from rain. As to the underflow and what I mean by that, it is the water that flows beneath this hardpan or through the sand—quicksand. In my meadows I suppose you would not have to go more than three feet to strike the underflow. You go to quicksand and immediately you strike the quicksand you strike water. In digging wells and putting them down you generally have to dig a

6006 pit around to let the cylinder go down below the pump a ways. I don't know whether you strike that water on practically a level with the water in the river or not, but you strike quicksand and immediately the water rises. When I came there the water level was just the same as now. I see no difference at all.

As to whether I could raise just as good crops on that meadow if there was no rainfall at all, I will say I don't know. We have when we have had very little rain. I don't know whether the amount of rain we had was sufficient or not, but then I have a good crop whether there is much rain or less. No, there has been no year when there was practically no rain. We didn't have a year when there was no rain, but it didn't cut any figure in regard to my crop of hay. Yes, we have had some years when there was very little rain, and during those years we raised just as good a crop.

6008 JOHN ROGERS, Great Bend, Kansas.

Direct examination.

By Mr. DAWSON:

I live at Great Bend, Kansas. I have lived in Great Bend three years, and have lived in Barton county since 1885. I became acquainted with the Arkansas river shortly after I came here in 1885. I then lived in the country about thirteen or fourteen miles north-

west of Great Bend. I have seen the river very often—every little while. Yes, sir, I have seen the river every little while
6009 since I have lived in the county during all that time (Objection.) During the last five or six or eight years, compared with the flow in the river for an equal length of time when I first knew it, I think it is a little heavier—a little more water. I have lived here about eighteen years, right on the river, and I have seen a good deal of the underflow. I have lived for about eighteen years right on the river, that is, about four and a half miles from it. I have owned that land down there about twenty-two years. I have driven several pumps down for wells on that land, and I also sank some about eighteeen or nineteen years ago. In late years we drove one, but not in the same locality. It is about six to seven feet to the water level. I don't think there has been a great deal of change in the level of the ground water at my place in those eighteen
6010 or twenty years. (Objection.) The level of the water under the ground into which I sank the wells, comparing the time when I first went there with the last few years I will say I never found any difference. Not much. Not anything to speak of. The crops that I raise as compared with those in the early days—they are as good if not better than they were in the former
6011 days. In as much of the county as I know of along the Arkansas river the crops in the last six or eight years are a little better than they were fifteen or twenty years ago.

Cross-examination.

By Mr. ASHBAUGH:

The crops are better because we get more. That is how they are better. I am not acquainted with what causes them to be better. Yes, I think there is more rainfall than we used to have.

As to the underflow and as to what I mean by that, I will say, why, that is the water that comes up from the river and flows back under the ground. As to whether the underflow is higher or nearer the surface of the ground when the river is full than when it is low, I would say, yes, sir, in some places three or four feet. Well, from one to four feet it will rise up in some points, that is, in the meadow.

It comes up a good deal on the surface in the low places. As
6012 to whether the underflow comes up near the surface of my land when the river is high and remains high for a number of days, I will say, why, yes, of course it must come up. When the river falls or becomes dry, then those ponds go dry. As to what furnishes these ponds with water, I will answer, what furnishes it is when the river is high we get this underflow current that fills in the ponds. No, sir, the ponds are not filled from the surface flow over the land. In some places, however. Those ponds I am speaking of are low places right in my hay meadow. They are low, and the water comes up and fills some of them up, not full, but some more and some less. As to the number of pools and ponds along there, the land is a mile

long; it is the whole of section 1. There is half of that land that the water don't have anything to do with—the rising or falling of it. As to how many pools there are on that half section, I couldn't tell how many. There may be five or six, something like that.

6013 We don't call those pools anything scarcely at all at home down there. I will tell you one thing, I wish you would keep your Colorado water away. I have got a brother in Colorado, and I told him I wished he would keep that water at home.

As to the crop being as good in a dry year as in a year when there is more water in the river, I couldn't say there is much difference, because it isn't long enough to hurt the grass a great deal. When the water does rise it will just help a little and then it draws out again, generally. We can get water by sinking three or four feet or something like that—four or five feet—down in that land most anywhere.

Redirect examination.

By Mr. GREGG:

In speaking of pools or little ponds I refer to low places in the land. There is nothing to indicate that these low places were once the old channel of the river, so far as we can see. Well, as to whether or not they were filled from the water running in from the river, the underflow made them full at the same time from the underflow. But still it would come in right there half a mile west of me and come down to our roads there. The underflow has nothing

6014 to do with the south half of my land, that is, with the land farthest from the river. This south half is altogether higher than the other part of the land. There are no pools on that higher land. As to whether or not those low places where those pools do fill up are in old channels of the river, I don't know. (Objection.)

Recross-examination.

By Mr. ASHBAUGH:

As to how far back from the river these pools, the farthest ones that are affected by the river, are, I will say I couldn't hardly tell how far they may be, but somewhere in the neighborhood of half a mile.

6015 E. E. EPPERSON, Great Bend, Kansas.

Direct examination.

By Mr. DAWSON:

I live three miles southwest of Great Bend. I have lived in Barton county since March, 1885. During all that time I have been

engaged in farming. I have filled an official position in this county; that is, as county treasurer. I went out of office two years ago. I am pretty generally acquainted with the farmers living along the Arkansas river in Barton county. My land is situated about half a mile north of the Arkansas river. I have 108 acres there in the valley of the Arkansas and raise on it wheat,
6016 corn and alfalfa. My land is all valley land, that is, bottom land. Yes, I have lived right there by the side of the Arkansas river in this county since 1884. As to the surface of the flow of water in the river during the last six or seven years as compared with the flow for a like period of years when I first knew the river, taking the year through, the average, I don't see much difference. If anything, I think a little more.

Yes, I have heard a whole lot about the underflow in Kansas. I have driven many wells on my place. The water level on my place is about six feet below the surface. When the river is full of water of course it is nearer the surface; when it is empty it is about six feet. I have never noticed any effect on this water level any farther than my own place. I am in the neighborhood of half a mile from the river. I don't think there has been any permanent change in the water level of the ground water since I came to this country.

6017 Comparing the crops we have raised in this county in the last six or seven years with those raised in a like period of time before that and since I have been here, they are better, I think. No, I have never heard anybody before the commencement of this suit complain that their lands have been injured in value or productiveness by reason of the falling of the general water level of the country in the valley. (Objection.) As to the climate and rainfall here now in the last few years as compared with the earlier years in which I lived in this county, I would say that the rainfall, while it might not be any more, is better distributed for our crops, and I think that that accounts for the better crops.

Cross-examination.

By Mr. ASHBAUGH:

6018 Barton county has had very good crops during the last four years, yes, sir. I don't think there is more rainfall in and about Great Bend than we had twenty years ago. But I think the rainfall is better distributed. I do not, of course, know as to the amount of the fall, whether we have more or less. I haven't heard anything about the amount of rainfall increasing.

The farthest part of my land is a mile back from the river. I think the underflow does rise and fall at the farthest part of my land correspondingly with the river, yes, sir. Well, as to the river affecting the level of the underflow at least a mile back from the river, I would say I think so. While I have never had any occasion to dig at the north side, so that I wouldn't know anything about

it, anybody that lives out there that has a celler can tell you
6019 it affects it whenever the rain comes up. Yes, sir, that is a matter of just common knowledge in that neighborhood. Everybody knows it, yes, sir; unless it is a man that hasn't a cellar; he might not know anything about this. During a wet season when the underflow is nearest to the surface the underflow has been within two feet of the top, and during a protracted drouth the underflow is ordinarily about six feet. The variation of the underflow is about four feet, to the best of my knowledge and belief on the question. Yes, sir, from my experience that is about where I would place it. And this follows the river, coming up after a rise in the river and going down after a fall in the river. Yes, sir, I would judge so. That is my observation. Yes, sir, my land is good land. I have been offered $50 an acre for it. If the underflow should go down below the lowest point it had ever been at and stay there, as to whether my land would be as valuable as it is now (objec-
6020 tion), well, my opinion is that it wouldn't. I don't think it would be as productive. If the underflow all along the valley should go down to the lowest point it was ever known to be at and remain there, as to whether the first bottom lands would be as valuable and productive as they are now (objection), I will answer that I do not think so. I think that the productiveness of the lands along the Arkansas river does depend upon the presence of that underflow to a certain extent, you understand.

I don't know as to the river banks having narrowed in since I came to this country. There are some men claim they have made land along the river here. So far as I know, I don't know personally in regard to it.

Redirect examination.

By Mr. DAWSON:

As to whether or not there is any evidence that the river in the
6021 locality of my farm at some period in its early history had different channels than it now occupies, I don't think so. Not in that locality. When we dig down in the ground on my place it is principally sand underneath.

No, there are no creeks or streams coming into the river in the vicinity of my place. I am right at the big bend of the river, on the north side of the elbow.

I am on the north side of the river. I don't know how high the river has to get before it affects this underflow. I know when the river comes down here bank full we can go out and take a spade and dig down and strike water at two or three feet, while when the water is down in the river you will have to go down to what I suppose is its bed. Nor do I know how high the river has to get before it begins to affect the underflow.

6022 JOHN F. LEWIS, Great Bend, Kansas.

Direct examination.

By Mr. DAWSON:

I reside in Great Bend, Kansas. I have lived here twenty-two years, and in Barton county thirty-two years. I am in the real estate business, and I have also been farming. The lands where I farmed are some distance from the river, up on Walnut creek, and are not affected by the Arkansas river at all. I have had an intimate acquaintance with the river for about twenty-four years, that kind of intimacy that I would get from travelling about selling lands. In my real estate business I handle farm lands, and in doing so I have found it desirable to travel about over the country, showing the lands to purchasers.

6023 As to my general familiarity with the Arkansas valley in this county, I would say that in 1874 I made a rude survey with a view to draining the Cheyenne bottoms to the river and with a view to draining that bottom in a speculative scheme to see what I could make out of it for a beet sugar plant. That was the first attention I gave to the formation and condition of the river.

As to the average flow of the river, that is, the flow for the whole period of a year, not just high or low water, during the last six or seven years compared with a like period of time in my earlier acquaintance with the river, I will say that the surface flow since 1897 has been much more uniform than it was previous to that time. That is to say, I don't think it sank so low or went so high as it did in former years in our drouthy seasons. We would have heavy rises and then it would sometimes go entirely dry. As to the total amount of the year's flow in the last six or seven years compared with the flow for a like period in the earlier years, as to my best judgment on that, well, I don't believe I could compare it with the earlier years because I didn't have such an intimate knowledge—

6024 didn't pay any attention to it. I know that since 1891, the year I moved on the place where I now live, I dug a cellar under my house, and up to 1897 I didn't have any annoyance with the cellar, but since then there has been water in it ever since, and I have been pumping for three years now and have had to fill it up.

As to the comparative flow of the river for the last six or seven years, say with the first six or seven of the twenty-four years when I first became acquainted with it, and as to whether it flows as much or less water, well, I don't think we have larger floods, save this one last spring, for the last seven years than we used to have, but I think we have more continuous water, that is, water that is running to some extent all through the year, than we used to at the commencement of that twenty-four years.

Yes, I have heard of this underflow or sheet or ground
6025 water. I don't believe I am sufficiently informed to give any positive answer from my own experience or observation as to whether or not there has been any general lowering or rising of the level of the sheet water or underflow in Barton county in the valley of the Arkansas river in the last ten years as compared with the first ten years that I knew the country. I was not situated so as to notice those things. I didn't live on the river except here in town.

You asked me whether or not before the commencement of this suit I ever heard any of the farmers in the valley of the Arkansas river in this county complain of their lands being made less valuable or less productive because of the lowering of the underflow or ground water. (Objection.) I heard one man make a complaint that the river was so low that his crop was injured—a man by the name of Harris down on the river here. He was raising potatoes. I might have heard somebody else, but I don't know or call it to mind. No, I don't recollect that I ever heard any general complaint of that kind. As to the man who complained as to his potato crop being affected, I think it was when he was raising his crop in 1881 or 1882.

6026 As to our crops that have been raised in this county in the last six or seven years compared with the crops raised in the county here in the valley of the Arkansas river in the earlier years while I was here, I will say that our crops are immeasurably better since 1897 and more uniform than ever before, with the exception of a few years like 1884 and 1878. Those were good years. Taking it as an average for a period of seven years, the crops are far better.

As to our rainfall and climate, and as to whether or not there has been any improvement in the last ten or fifteen years, I don't believe that I could definitely answer as to the total rainfall, relatively, in a whole year, but our rainfall during the last of April, May and June has been better for the last seven years than ever before except the years 1884 and 1878; that is, the rains are better distributed and are more uniform and come at the proper time of the year, and that makes a better and more reliable crop. As to what we
6027 depend on in this county to make a good crop, well, outside of the river bottom it certainly depends on rainfall, and of course when the river is low we have to depend entirely on the rain for our crops on all classes of soil. As to the comparative productiveness or value of the uplands and the bottom lands here, there is a divided opinion on that subject. We have a class of people here who prefer the valley land, and some who prefer the table lands to the valley lands, and to take their chances on the rainfall. Yes, sir, during all the years when there is a good rainfall, well distributed, Barton county has good crops.

Cross-examination.

By Mr. ASHBAUGH:

Taking a series of years when there is but little rainfall, or very poorly distributed, then the bottom lands are the more productive, because the moisture rises from the sheet water below, beyond a doubt. As to the underflow along the river here affecting the productiveness of the bottom lands, I will answer, the first bottom lands it unquestionably does affect in some crops, for certain crops most certainly. Those crops are alfalfa, corn and potatoes,
6028 and all vegetables, yes, sir. Barton county is now going almost entirely into wheat raising.

Yes, sir, the underflow does rise and fall with the condition of the river. As to the bottom lands being as productive if the underflow was very low and remained that way as they would be if the underflow was higher (objection), I will answer, not so productive for alfalfa, wheat or corn. I mean corn or potatoes; I don't mean wheat. Yes, we raise a good deal of wheat right on the bottoms. There is a good deal of wheat raised all over here to the west line of the county, in fact all along the river. This county is going into wheat quite extensively. Yes, in the last two or three years they have been pretending to raise corn on the uplands. Well, no, they don't. They might say so. There is no pretense to raising corn to any extent on the uplands. If they were attempting to raise corn on the uplands it would be with the expectation of heavy rainfall.
6029 (Objection.) In a moderately dry season we are more liable to have a good crop of wheat on the uplands than of corn. As to how far back from the river in different directions the underflow extends (objection), I will answer, it extends back to Walnut creek and a short valley beyond Walnut creek to the north, and it extends about sixteen miles to the south. A hard under-formation stops it on the south.

Yes, sir, there are sand hills through here. It is a drift of sand that was deposited in those hills by winds, and quite a good deal of silt mixed with it. Those sand hills run parallel to the river on the south side through Barton county, and I know of them running through other counties all up and down the river on the south
6030 side and parallel with the river, about the same distance. I am not acquainted with Kiowa county. As to sand hills in Stafford county, yes, sir, there are sand hills in Stafford county.

As to the underflow extending east from Kinsley to any extent (objection), I will say yes, sir, I think the underflow goes to Wichita. My chief evidence is, the Ninnescah comes out of the ground in Pratt county and is a stream from the Arkansas river. The river rises and falls with the rise and fall of the Arkansas river; that is, the Ninnescah. At Saratoga they once had a little mill there that could always run industriously when the Arkansas river was up, but when it was down it couldn't. I am not familiar with the springs of Pratt county. I know that the north tier and about half of the

second tier of townships has this sheet water in it in Pratt county. It is irregular. The line is not straight, but it is practically defined
from the fact that whenever you can drive a permanent point
6031 down in the ground and get water, that has an underflow,
especially when the water rises in the pipe with the rise and fall of the river. As to that being generally known and acted upon through Pratt and Kingman counties, that the Ninnescah gets its source from the underflow, to a certain extent rising and falling with the rise and fall of the Arkansas river (objection), I will answer, yes, sir, that is a fact.

Redirect examination.

By Mr. DAWSON:

No, I didn't know Mr. Ashbaugh, counsel for Kansas, when he lived over on the Ninnescah. I have heard him make some political speeches here. I never got acquainted with him to talk with him until about a month ago, I guess.

Q. About a month ago he called on you in reference to this case, did he not?

A. I met him at the Kendall hotel. I got acquainted with him
there and got to talking with him before I knew who he was.
6032 Yes, sir, we had a discussion about this case, about a month
ago. No, sir, I never saw Mr. Ashbaugh this time until I saw him sitting here at the table.

Recross-examination.

By Mr. ASHBAUGH:

Yes, sir, we had a very pleasant discussion over it, too. Indeed we did, very pleasant.

6033 EDWIN TYLER, Great Bend, Kansas.

Direct examination.

By Mr. DAWSON:

I live at Great Bend. I have lived in this State and county ever since 1871. It will be thirty-four years this coming October. I have been in a good many kinds of business. I was a restaurant keeper in the early days, and I was also in the real estate business in the early days, in the grocery business several years, and am in the millinery business at the present time, I and my wife. Yes, in the various businesses I have been in I have gained a large acquaintance with the people of this county, and I have had an acquaintance for the last twenty-five years with a large number of
farmers living up and down the Arkansas river in Barton
6034 county, ever since I have been here.

No, I don't call to mind that I ever did before the com-

mencement of this suit hear any of the farmers complain that the value of their lands was being lessened or their productiveness decreased because of the sinking of the water level underneath the ground.

Yes, sir, I have been familiar with the Arkansas river ever since I have lived here. As to the flow of the river, taking it the year through, of late years, say over a period of seven or eight years, compared with the flow for a like period of years twenty-five or thirty years ago, in my judgment it is a little more than it ever was before in the time I have lived here.

Yes, I have had occasion to notice, myself, whether or not the general level of the underflow or sheet water of the country has sunk or raised below or above what it was twenty-five or thirty years ago, and I will say that I have from 1871, the time I came here, until the fall of 1876, dug wells here just across the first drop over there from this court house. I dug wells there for the first three or four years and planked them up with plank; and I took a homestead four and a half miles southwest, and in 1875 I did the same there,
that is, I dug a well and curbed it and drew water with a
6035 bucket. Aside from local or temporary changes that might
exist by rainfall or surface water running into the wells, I couldn't express any definite opinion, as you see I have had no experience lately, only as I see the river.

As to the crops in this locality along the Arkansas river during the last seven or eight years as compared with a like period in the earlier times, I would say it has been better than any like period or any like seven or eight years. But there were years like 1877 or 1878 that were just as good.

As to the climate and rainfall for the last seven or eight years as compared with the earlier years, I am not capable of saying whether it is more or less, but it is my experience or it is my belief that it is better distributed in the growing season.

Cross-examination.

By Mr. ASHBAUGH:

In some places the river is not as wide as it used to be. There is some made land along both banks of the river, yes, sir. There are a good many islands in the channel of the river now. There are always more or less. They disappear when the river rises,
and when it is dry—— Yes, I think there are a little
6036 more islands in the river now than there were thirty years
ago. There have trees grown up on them, yes, sir. As to the flow of the river from 1888 to 1895, oh, in some years it was good. In some years we had floods and in some years it was dry. As to the ten years before 1888, it was rather dry. There were periods from 1871—there were dry years and wet years every once in a while. Last year was rather a wet year. I mean by that that we had a good deal of rain last year. The rainfall doesn't have

very much to do with the river, I think. (Objection.) The
6037 river very seldom rises after a rainfall here. It has to be a very hard rain to raise it. In the early days it would rise more than it would now at the present time. Last year there was some flow most all the time, or all the time in fact. I think this—that the river runs the year round more water now than it used to. That is, in going down there I find it running. When I used to go down I could go up and down for long distances without finding a pool of water, and I haven't been able to do that in the last few years. In the fall of 1903 there was some water in pools and when the river was up. There is no year but what the river has its rise. Well, now, I couldn't tell you whether there was any water in the river in the month of August, 1903. I was down there in
6038 August. Yes, there was water in the fall of 1903. It was in pools along the banks. I don't know where it came from; it was there. As to whether there was running water in the river in the fall of 1903, oh, well, I would say I don't recollect. I don't keep any memoranda of those years, only in my mind. But in the fall of 1903 I didn't say it was running. It will be very seldom a year you will find it dry along three or four months, with the exception of the last seven or eight years. Last year it ran most of the time. I don't recall now whether it was dry for three or four months in the summer and fall of 1902. I don't recollect
6039 how it was in 1901. I couldn't say how it was in 1900. It is true that I have visited that river off and on ever since 1871, in the early days oftener than in later years. But in the early days I used to go down there and find no water, and very seldom find a pool at certain times of the year, but in late years I generally find the river running a little stream or in pools. Now, as to the date in the year, I couldn't tell you. There were some of the years 1900, 1901, 1902 and 1903 when it ran some time. As to my having a recollection of it in the fall, I don't recollect the year, no. As to recollecting whether there was any running water in the river in the fall of either of those four years, I will say they were dry
6040 years. But I don't recollect seeing any during the fall of those years.

Yes, sir, I have seen fish in the river in those early days down to the mouth of the Walnut. There is fish there yet in the river. There was fish in the Arkansas river in those early years. When the stream gets down we catch them in pools, or used to, and I guess they do yet. As to hearing of that lately, I would say about two years ago at least. That was up the river here. These fish came up the river when the river would rise. No, there wasn't a good many fish in the river in those early years; we always had to go to the Walnut to fish. Yes, there was fish in the Arkansas river in those early years, at the mouth of the Walnut. I don't know
6041 where they grew. They were there, that is all I know. (Objection.) Yes, whenever the Arkansas river is up there is fish in there. I suppose that is true. I haven't had any experience,

though, in late years in fishing, and I haven't known of anybody going fishing in the Arkansas river lately. I never knew anybody to take a rod and line to fish in the Arkansas river only at the mouth of the Walnut, but I have known them when the river would go down to take gunny sacks and go to those holes and catch fish. That was in the early years, not lately, because the fact is that the people have gotton so well off they don't have to fish in that style.

6042 Barton county has been raising wheat to such an extent that it is very satisfactory and very productive, yes, sir, and wheat is the principal crop.

Redirect examination.

By Mr. DAWSON:

Yes, when counsel for Kansas asked me whether there was any water in the river in 1900, 1901, 1903, and 1904, I meant to say that there was no year but what there was water in the river while I have been here. And in speaking of the flow of the river during the last six or seven years as compared with other years, as based upon my observation, I was not attempting to specify any given month or part of the year. No, I didn't say to him that the last four or five falls had been dry falls.

Q. I think I understood, and I think counsel possibly did, that you thought he was referring to 1890, 1891, 1892 and 1893 instead of 1900, 1901, 1902 and 1903.

6043 A. That is the years he was talking about.

Q. No, he was talking about 1901, 1902, 1903 and 1904.

A. Well, of course they were dry years.

Yes, I believe four years ago it was a dry year, and 1902 and 1903 I think were wet years. Last year was a wet year. They raised all kinds of crops. They raised corn on high land and low land.

Yes, I spoke in reference to the fact that in the early days the local rainfall had more effect upon the river than it does now. That was because the land was not ploughed. The water ran off easier, and if we had the same conditions now as we had in the '70's your river wouldn't narrow so much or wouldn't have so many islands.

As to my opinion as to what helps to make this made land and these islands along the river, I don't know what would make it, but what would keep it from being made would be millions of buffaloes tramping over it and thousands of cattle as we used to have them here, keeping the underbrush all tramped out, where now it grows up and allows the timber to grow up. The little cottonwoods starting from the seed along the banks of the Arkansas river had little chance to become trees in those early days when the buffaloes and

big herds of cattle were here—but very little chance of ever
6044 growing without it was a very wet year. And as to the prairie fires, they often ran over the country and ran down on the banks of the river.

Recross-examination.

By Mr. ASHBAUGH:

No, the buffaloes and the prairie fires did not fill in the banks of the river, but they kept them tramped down.

6045 F. D. WILSON, Great Bend, Kansas.

Direct examination.

By Mr. DAWSON:

I live at Great Bend, Barton county, Kansas. I am city marshal. I have lived in Barton county a little over twenty-nine years.
6046 I have lived about ten miles southwest of Great Bend, and I was a year or two about ten miles northeast. I have been familiar with the lands of the Arkansas river in this county most of the time since I have been here. Great Bend is situated in the Arkansas River valley.

Yes, I have had occasion to dig cellars, wells or post holes in the valley of the Arkansas river in this county, and I have observed the ground water or underflow. As to the general level of the ground water or underflow in the valley now or in late years as compared with the level of the ground water or underflow in the same locality in the earlier years, I don't think there is any difference in it.

No, sir, prior to the commencement of this suit I never heard any of the farmers or people living along the valley of the Arkansas river in Barton county complain that their lands were being made less valuable or less productive by reason of the subsidence or sinking of the ground water or underflow. (Objection.)
6047 Yes, sir, I have been interested in farming and in the crop production of this county in the years I have been here. Most of the time I have been engaged in farming, myself. I commenced to farm in 1878 and was farming a couple of years, and then I didn't do any farming until about six or seven years ago, and I have been farming ever since.

Yes, I have come in contact with the farmers who operate in this county along the valley of the Arkansas river. My land is right in the valley. Yes, sir, I have been familiar with the lands along the valley of the Arkansas river. Comparing the crops for the last seven or eight years raised on the lands in the valley of the Arkansas river with those raised for any like period of time in the earlier years, I will say that on the average the last six years have been the best six years we have ever had since I have been in the county.

As to the values of lands along the valley of the Arkansas river in Barton county at the present time compared with the value of the same lands in the earlier years since I have lived here, of course when I first came here most or a great deal of the land was railroad land. It was worth, I think, along in the valley up here,
6048 about $4 an acre, out for quite a ways, two miles say, from the river. Then the land got up so that it was worth—I think it has been up as high as $2,000 and $3,000 a quarter, and for the last six years land has been going up and that land now is worth $6,000 a quarter. No, there has never been a time since I have lived in this country that the farming lands in the valley of the Arkansas river in Barton county were worth any more on the market than they are now. They are worth double now what they were before.

Cross-examination.

By Mr. ASHBAUGH:

Yes, sir, the underflow rises and falls with the condition of the river, so that when the river is up the underflow is up and when the river is down the underflow is down.

Well, I don't know whether this county has developed generally as well as all other parts of the State or not. I couldn't say about all other parts of the State. This county is developed all over the county.

Redirect examination.

By Mr. DAWSON:

6049 As to what I have personally noticed in reference to how far back from the river the underflow is affected by the rise and fall of the river, I will say about three-quarters of a mile.

Yes, in the early years when I was here I saw the Arkansas river dry; that is, practically so. I used to drive cattle. I have been in the cattle and horse business, and I used the river to drive in until I got to about—that is to say, I think about 1882 or 1883—and I used the river to drive in about twelve miles of Dodge, and there was water at places. There was no running water until we got there, when the river came down. That is, starting from this point, about twelve miles from Dodge, down below the fort there.

Recross-examination.

By Mr. ASHBAUGH:

That time was in May. Yes, sir, there was water in the
6050 river all the rest of that year. I couldn't tell you whether the river was dry here in 1900, nor in 1901. I recollect this time in April because I drove there. I couldn't say whether the river was dry in 1902, nor in 1903.

6051 JOHN F. LEWIS, Great Bend, Kansas (Recalled for Further Cross-examination).

(Objection.)

Cross-examination.

By Mr. ASHBAUGH:

Yes, sir, there were hot winds in the early years in this country. They have disappeared since 1897. As to what reason I could assign for their disappearance, I will state it is the development of Oklahoma by being plowed and planted, and Texas; that the hot winds that have injured this country came from the gulf of Mexico across the arid plains of Texas and Oklahoma when it was not in cultivation and became so heated that they burned our crops in Kansas, and after the plowing up of Texas and Oklahoma the vapor came from those fields and ladened the winds with vapor
6052 until they were cool and didn't burn our crops any more. Yes, sir, it was noticed that the hot winds subsided shortly after the breaking up of the sod in Oklahoma and Texas. In the years 1894, 1895 and 1896 there was more sod broken up in Oklahoma and Texas than in any other period in any other country in the United States. The decrease in hot winds was most noticeable in 1896 and 1897. It was remarked by everybody. There have been no destructive hot winds in this part of Kansas, except one season immediately after harvest time here we had a little hot winds, and it was generally believed to be caused by dry stubble. That was the reason.

As to the Arkansas river having narrowed its banks in later years through Barton county (objection), I will say, sir; not in the last year particularly but in the last ten or twelve years I think it has narrowed. I have not noticed whether it narrowed any
6053 in the last year. I wouldn't say that, but in the last ten or twelve years I think it has narrowed. As to the extent, I haven't given enough attention to that. I have just noticed it in localities. Now, recollect, I don't mean to say—I think the islands have increased and destroyed or reduced the river bottom area and in places the entire river has narrowed. As to when this narrowing became noticeable (objection), I think it commenced some eight or nine years ago when it was noticeable to me. As to whether the river bed has materially filled up within that same period (objection), I think it has in some places. As to what evidence I have of that, I will say that I have noticed it at the bridges
6054 more than anywhere else. That is, where I would be crossing. Of course I haven't been up and down the river between the bridges to any great extent, but there seems to be some islands in the river and at the bridge it seems to have raised up so that you can't go under the bridge like we used to. That is what I have noticed more particularly than anything else. Yes, we

could go under the bridge when it was first built, anywhere under the bridge here at Great Bend. (Objection.) We could drive under it. Yes, sir, we did drive under it. They have driven their wagons under it. I drove my buggy under the bridge here at Great Bend. I don't know that I did anywhere else, but I did here. I drove under, sitting in the buggy. I don't know whether I had to bob my head down or not now. I went under quite easily, but I don't recall how that was. Yes, sir, there are islands in the river right at the bridge at Great Bend now that were not here then.

6055 (Objection.) I have not noticed how near the bridge is to the level of the top of that island. I have not noticed right under the bridge, but standing on the bridge and looking down at the island it is quite close to it in one place, but I wouldn't say how close. Four or five or six feet, somewhere along there. Yes, sir, those islands have tended to become more permanent in the river. As to what caused that, my theory is that the cottonwoods have grown there and the roots are very tenacious and hold firmly the islands in their places so that they don't wash out. As to when those islands got to be so permanent that the cottonwoods could get a root-hold (objection), I noticed five or six years ago that the cottonwoods were becoming permanent and holding the islands in a permanent condition. I noticed it five or six years ago and called the attention of a number of our people here to the fact. Those islands form when the river is low, by small obstructions, such as cottonwoods or anything that might get in the river, and the winds drifting the sand about them, and it will commence

6056 to build up a little island, and then if the vegetation takes root in that, that holds any dust or sand that may drift into it and keeps it building up by degrees. This has been going on, I think, for the last ten years. At least that long. As to the capacity of the river bed and the river channel through this county being as great for carrying off water as it was twenty-five or thirty years ago (objection), I will answer, I think the channel capacity has decreased. As to what effect that has upon the apparent amount of water that flows in the river (objection), I will say of course when the channel capacity is not as large as formerly it raises the water up and gives the appearance of more water when practically there is no more water—there is not as much.

6057 As to the fact if the same amount of water should now be flowing in the river that there was thirty years ago, as to whether the river would look to be very much higher and to be carrying very much more water (objection), I will say I think so, yes, sir.

Redirect examination.

By Mr. DAWSON:

Q. You attribute the subsidence of the hot winds to the breaking up of the lands in Oklahoma and Texas. Is it not true that within

the last eight or ten years a great deal more land has been brought under cultivation in western Kansas up along the Arkansas river than there was prior to that time?

A. That is true in the last five years, but not as long ago as ten or twelve years.

Q. Well, if there has been more brought in in five years there has been more in ten years, has there not?

6058 A. No, the plowing up of this western country did not commence until five years ago.

Yes, it is true that there is more land plowed up and in cultivation now than there was ten years ago.

Yes, it is true that the hot winds have continued to show a subsidence during the last eight years. Yes, I think there have been many thousands of acres in the last eight years put under cultivation in eastern Colorado as well as in western Kansas, but I am not so well posted about eastern Colorado. Yes, as to the cultivation and irrigation of lands in eastern Colorado and the cultivation of lands in western Kansas, and as to that materially aiding the cultivation of the lands in Oklahoma in cutting down the hot winds and improving the climatic conditions, I think it has exercised great influence in Kansas—greater than it has in Oklahoma. Yes, sir, I think this irrigation and cultivation to the west is a benefit to this climate.

Yes, as to the river filling up and my formerly having driven under the Great Bend bridge, it is true that I drove under

6059 there at times when the river was practically dry, most always.

Oh, yes, if the river were dry to day, the 6th day of May, 1905, it is true that you could drive in a buggy under the bridge where the main channel goes under it near the south side of the bridge. There are probably two places where you could drive through now the same as we did then. Yes, there is water in the river and there has been a good flow of water in the river for about a week. I don't know as the good flow has been longer than that. We call it a good flow. There has been water in the river continually now for a year, I think, so that you could see water there.

Q. But there has been a good running stream of considerable volume for two or three weeks past, has there not,—not as big as today but a considerable volume?

A. Well, the normal condition of the flow in this river for the last year when it is not up exceedingly high was not very great. It probably would be fifty feet wide and six inches deep.

Oh, yes, we have had a big flow of water here for two or three weeks past, and the stream has been more than fifty feet wide and six inches deep.

6060 Yes, sir, this has always been a river of shifting sands and changing channels since I knew it, and under the bridge here at Great Bend the main channel is sometimes in one place and sometimes in another. Yes, sir, there have been no islands washed out near the town here during the last six years.

Q. Is there not an island right below the bridge that is going out pretty rapidly now?

A. I have just been told so this morning, but hadn't seen it for the last week.

I don't know what has taken place during the last week. I haven't noticed it. No, if it is true, if the island is being washed out, it is nothing unusual or strange. Yes, sir, the river builds an island one season and sometimes destroys it the next. However, in further explanation of what I have said a few moments ago, the waters of this river will cut away the banks where there is no growth. They will wash away the banks. But where the islands have a growth of cottonwood it will not cut them away. It
6061 will hold better. Well, it does cut them away even then sometimes, unless the trees fall into the river, but not within the last six or eight years to any extent, I very much regret to note.

Q. Is it not true that right now and within the last three weeks the river has cut off parts of the main land so that it has allowed cottonwood trees forty or fifty feet high to fall into the river, and that there is now lodged against the Great Bend bridge living cottonwood trees with green leaves on them that have been washed into the river?

A. That may be so, but I haven't noticed it. I haven't been down to see. That may be true.

Yes, it is true that whenever a tree is washed off into the river and sticks somewhere in the sand that furnishes the nucleus for the building of an island when the river gets lower, because the sands blow against it.

Yes, I was here in buffalo days. I killed one down here on the river sometimes. Yes, in the early days there were cattle running loose on the range here in great numbers. The buffaloes and the
6062 cattle had quite an effect in the way of preventing the starting up or growing of little trees along the banks of the stream. Between the buffaloes and the fires it kept our timber down entirely. Yes, sir, those two causes have now largely disappeared. Yes, because of their disappearance the trees along the banks of the river had a better opportunity to grow and there would be less encroachment upon the stream. That is, they had a better chance to grow and do grow upon the stream. But I don't think the trees encroach upon the stream any. I don't hardly think they do, except upon the islands where the tenacious roots hold the islands from being washed away, and the banks also. When they once lodge on the banks it holds the lands so that the river can't wash it away. Yes, it is true that they have the effect of stopping up the channel by holding the island, and the same effect by holding the banks and preventing the cutting and widening of the stream which the island would otherwise make natural. Yes, we surely are glad to see the timber grow along the streams, and while they bring their disadvan-
6063 tages, they also bring their advantages. Yes, sir, it is true that the abutting land owners along the stream in this county have

shown a willingness for little channels between the main land and the islands to close up, so as to attach the islands or what have been the islands to their main land and thereby increase their holdings. (Objection.) Yes, sir, it is also true that in some instances they have rather aided that by artificial means, such as the putting in of little trees or sand bags or other artificial obstructions in these small channels so that the channel may be closed up and thereby attach what had been an island to the main land. (Objection.) Yes, it is true that some of the bridges have been shortened for the purpose of making bridge construction less expensive, and a grade established at either end leading up to the bridge, which narrowed the river. (Objection.)

Recross-examination.

By Mr. ASHBAUGH:

6064 If there were no water in the river today, no, sir, you couldn't drive under the bridge there between as many bents of the bridge as you could when the bridge was built. Yes, sir, I think probably there are three bents we could drive under now, and my recollection is that when the bridge was built we could drive under all of them. You couldn't drive under the others now if there was no water in the river, on account of the accumulation of sand and an island there. I think there are nine bents in that Great Bend bridge, but I wouldn't be positive. But I am under the impression that there are nine. That would be within two or three of it.

Redirect examination.

By Mr. DAWSON:

6065 Yes, I think the wooden bridge here at Great Bend has been built some fifteen or twenty years. My recollection is that formerly the old bridge extended 300 feet farther south. As to what has been done at the south end to make a part of the bridge unnecessary there, well, it filled in there under the end and they concluded that by a little grading expense it could be reduced and they could shorten the bridge.

Q. Is it not a fact that by the narrowing of the channel of this river, while there are some bents that you could formerly drive under that you couldn't now, where the two main channels, as the river is running today, go beneath the bridge, it has scoured out deeper than it was in the days when you spoke of having driven under the bridge?

A. Well, I don't know but that it may be a little deeper on the south side.

On the south side where the main body of the water comes through it may be a little deeper.

Yes, it is true that by reason of its being crowded in on the south side and confined it is at this time cutting in back of the abutment and there are sand bags and various means of protection, such as a board rip-rap or sheeting, put there to protect the bank.

HUTCHINSON, KANSAS, May 6–8, 1905.

6067 A. A. SWARENS, Hutchinson, Kansas.

Direct examination.

By Mr. DAWSON:

I reside at North Reno, Kansas. That is about two and a half miles from Hutchinson. I have lived in that locality since
6068 June, 1871. I have been engaged in farming during this time, and have three 80's up there. In the early days I raised considerable wheat, but have been raising corn. I have had ground in corn for twenty years, and that is about a mile and a quarter or a mile and a half from the Arkansas river, and Cow creek runs through my land. I have land on both sides of it, yes, sir.

I have been familiar with the Arkansas river since 1871. In reference to the flow of that river in late years as compared with the earlier years, taking it over a stretch of five to seven or eight years last past and an equal period in the earlier years, I would say I can see but very little difference.

Yes, sir, I have heard of what is called the underflow. I have read of it. That refers, as I understand it, to the water lying underneath the surface of the ground.

6069 The highest place to water on our place is ten feet. Yes, sir, I have had open wells on our place. I sank one in the fall of 1871, and I have go- an open well now on the same place and on ground of the same elevation. The level of the ground water at the present time, compared with the level of the ground water in the earlier times, is just the same. It is standing just about ten feet. So far as I have had opportunity to observe, there has been no perceptible or definite change in the level of the ground water of that country since I settled there, no, sir.

As to the crops in our locality and in the vicinity of Hutchinson in the valley of the Arkansas, compared for the last six to eight years on the average with the crops for a like period during the earlier years, I would say that our crops now are better.

As to the values of farming lands in the valley of the Arkansas river now as compared with the values of the same lands at earlier periods since I have resided here, I would say the land now
6070 is the highest, I think, it has ever been, unless it was in the time of what I call the wild-cat boom. There was a while here I believe in 1888 that there was what I call a wild-cat boom. That boom was mostly around the town, I think. I wouldn't say

positively, but I think it was mostly in city property—the boom prices.

As to whether prior to the beginning of this suit I have ever heard any of the farmers of Reno county living in the valley of the Arkansas river complain that their lands had been made less valuable or less productive by the subsidence or sinking of the underground water or the underflow, I never heard of it. As to the climate in this locality for the last seven to ten years compared with that of earlier times in reference to its value for the growing of crops, I would say I believe that as the country has grown up the climate has been better. Of course we have dry years, when the crops are not so good, but I think as a general rule the crops are a little bit better. There are not nearly the hot winds there were in the early days.

Cross-examination.

By Mr. ASHBAUGH:

6071 Yes, sir, my lands are on Cow creek. It runs through them. Cow creek has flooded my lands lately. We had two floods two years in succession. I am not positive where Cow creek rises, but I guess up in Rice county somewhere thirty or forty miles above us. It heads up in a rolling country, and I expect its source is seepage and rains and spring water. I suppose it is surface water. I don't know. No, sir, Cow creek never goes dry. Yes, it gets higher in the spring rains or at any time when we have heavy rains. As to the Arkansas river getting higher at one time than another, a little shower would start it to running in the early days, but it generally rises during the melting snows in the mountains.

6072 So I understand. It generally rises in June. I don't remember how long those June rises lasted in the earlier years. I don't think they would last a month or two months. I don't know how long. I couldn't answer that question, because I never noticed it. I never timed it. Yes, sir, I guess the river rises as it used to. It is pretty full now, this 6th day of May, 1905. As to what influence or effect the high water in the Arkansas river has upon my land, I would say none that I know of. I am not injured by it. I don't know whether I am benefitted or not. I don't believe I am. So I have no interest in it whatever, one way or the other.

6073 Yes, it is about ten feet to water on my land. The well I dug in 1871 was just a dirt well. I shovelled it out. It was ten feet to water. Now, mind you, I didn't measure it, but I cast the dirt out without having any help to do it, and as near as I could judge it was ten feet. When the Arkansas river is up, as to whether the water rises in that well, I never noticed. That well has been filled up many years ago, probably twenty-five or twenty-six years ago. It was open two or three or four years. Well, I have a well right there now. As to the only way I have of judging of

the underflow from that well being during two or three years when it was open, I will say I don't know about that. If that well was ten feet to water there and this well I have here—well, that is all the answer I can make. After that well that I dug in 1871 was filled up I couldn't tell anything about the level of the underflow.

6074 Yes, sir, the only way I could judge of the level of the underflow was from that well during the two or three years it was open. The well that is there now was dug about three or four years ago. I couldn't say what year. I don't remember exactly. I never thought anything about this, and consequently never put any time down. It might have been dug in 1900. It might have been back in 1900, but I wouldn't say. But it was dug somewhere about 1900, 1901 or 1902. It is about 300 yards from where

6075 the first well was, and is just as nearly on land of the same level as it could be. I didn't dig the second well, I had a man dig it. I draw the water to water my hogs every day. I don't know the time of the year he dug this well. I don't know whether the Arkansas river was up or down, full or empty, when he dug it. He went ten feet, just as near as I could guess without measuring it.

As to how often I have been to the Arkansas river lately, oh, every little while. I was at the river about a month ago, but haven't seen it since. No, I haven't seen it since two people were

6076 drowned in it up there the other day, nor since the bridges went out above here the other day. I couldn't say how often I saw it last year. I passed over it several different times. My land is about a mile and a half or a mile and a quarter from the river. I can't see the bed of the river from my house; there is too much of a grove in there. I don't know how long those groves have been standing. I set out some trees in the early days myself, and I don't know, I have been setting out more or less all the time. Every man has a grove between him and the river. My land corners with the land of Mr. Sheridan Ploughe. It runs up along the side of one 80 there. Mr. Ploughe has a grove between my house and the river.

As to the underflow not being higher at one time of the year than another, I will say, well, now, I can't say that I know. No, sir, between 1874 or 1875 and 1900 I have no means of knowing the condition of the underflow under my land. Yes, sir, Cow

6077 creek is between my well and the river. No, sir, for about twenty-five years, from 1875 to about 1900, I had no other well from which I could ascertain the level of the underflow. We have had these drive wells. No, you can't tell the level of the underflow from a drive well. We mean by a drive well a galvanized two-inch pipe, and we put them down until we get pure water, and we drive it down 58 feet. Yes, we would get water at ten feet, but we drive on down to get a different class or stratum of water.

Yes, I have corn out this spring. This year it is not so good, and the year before last I had this same ground in and it was not so

good, but I had other ground that I had rented for garden purposes that had never been manured, the same quality of ground
6078 exactly, and on six acres I had nearly 400 bushels. When you put corn in year after year, the substance that produces corn in the soil seems to wear out. I shall change my corn, which I intend to do this fall, and put it in wheat. This year I have got it partly in barley. No, that piece of ground was not miry twelve or fifteen years ago. No, it was not wet. My land up the river there is not very wet when the river gets high. When Cow creek is high it overflows, as I said a while ago. Two years ago I had water three feet deep on my place there, when the flood of last year and the year before last came.

6079 No, corn roots will not go down ten feet to get moisture from the underflow, nor derive any benefit from moisture ten feet below the surface. So if the underflow never came nearer than ten feet to the surface the underflow would not affect my land as to corn, no, sir. Yes, I have raised alfalfa on it. I think alfalfa roots will go down that far, from what I can understand. Yes, that would be good alfalfa land, and it might be because of the presence of that underflow ten feet below. I don't know anything about whether alfalfa land will be better with the underflow ten feet below the surface than though the underflow were twenty-five feet below the surface, but I don't think the underflow—I think it is just the same as when I came there. But I have no means of judging of the level of the underflow except by these two wells at each end of my
6080 experience. No, I don't go down to the river very often. I used to go fishing. That was years ago—probably twenty-five years ago. Yes, sir, during 1871 and down to about 1886 we could catch fish in the Arkansas river if there was water in it. No, you can't catch fish there when there is no water.

Redirect examination.

By Mr. DAWSON:

Some time in the summer of 1871 my father and I went across the river and we got buffaloes over there, and coming back the river was dry, only just here and there a hole, and I said to father "I wonder if there has any fish been caught in that place." It
6081 was warm. I remember now it was in August. And I jumped off the wagon and ran in, clothes and all, and something struck me in my legs, and I told father "There is something in here." So he got off and came in. We were very poor and anything that way was helping us out. So he said it must be fish, and we went over home and took our wagon sheet and went back and tied the ax and everything on to sink the wagon sheet, and we made a draw and the first try we didn't get anything and the next one we got two catfish that weighed 65 pounds each. One weighed 40, and another was about two feet long. The river was dry then, only just once in a while a hole where there was water. You could scratch

down in the sand and find water. Yes, after that time in 1871 I have seen the river dry many times in this county so that there was no flowing stream. Now, I wouldn't say whether I have seen it dry in the last fifteen years prior to 1904. I don't know whether it has been dry for quite a while or not.

6082 DAN WELCHONS, Hutchinson, Kansas.

Direct examination.

By Mr. DAWSON:

I live in the city of Hutchinson, Kansas, and am engaged in the livery business and buy and ship stock, and have been for the last twenty years. I am acquainted with most all of the farmers throughout the country, yes, sir. I buy from them and deal with them. Yes, I own considerable property here, some of it real estate.

Yes, I pay a good deal of taxes. I have been here since the
6083 fall of 1872, and this has been my home all the time, yes, sir.

In the early years I was not in much business. I was pretty young when I came here—only twenty years old. During the first fifteen years I was here I worked four years and three months in the Atchison, Topeka & Santa Fe railway office, and then I got to work for myself. Yes, sir, I made all I have got right here in this county.

I have been acquainted with the Arkansas river in its course through Reno county since 1872, and I have had occasion to go up and down the river. I have been buying stock a good deal and travelling over the country, and have seen the river very frequently.

As to the average flow of the river for the last six or eight years, taking one whole year through with another for that period, not picking out any specially wet or dry year, compared with the aver-

age flow of the river for six or eight years in the '70's when
6084 I knew it, I would say I have not seen very much difference.

Along in the '70's we had awfully dry weather here and the river was very low. I don't think the flow of the river on an average for six or eight years last past varies very much from what I have known of it since I have been here, excluding any special year. Well, I couldn't say. As to whether the river is as good today for all practical and ordinary purposes as when I first knew it, on the average, I couldn't say as to that. I don't think there would be any difference so far as my judgment is concerned. I would think it as good a river now.

Yes, sir, I have heard of what is called in Kansas the underflow or ground water. The town of Hutchinson is situated right in the Arkansas valley. As to whether the level of the ground water or underflow here at Hutchinson has changed from what it was when I first came here as to its distance from the surface, I will say I

don't think there is any difference now. Yes, sir, I have
6085 seen excavations in the way of cellars or basins or wells made in the early days and then openings of that character made in the later days, so that I have had an opportunity to see how far they have had to go for water in the years when I first came here and about how far they would go in the last few years, and from this observation I have not noticed any difference in the water level in this immediate locality or valley. I have not noticed any difference. As to whether I ever heard any of the farmers of this locality before the commencement of this suit complain that the level of the ground water underneath their ground had sunk and that thereby their land was damaged either in market value or productiveness, I would say no, I have not.

As to the crops raised in the valley of the Arkansas river in Reno county during the past six or seven years on an average, compared with those raised in any other period of six or seven years prior to that time, I think the crops have been good in the last three years. I think the crops have been an average, and a little better. And taking it for a period say of five or ten years, and comparing the last five or ten years, on an average, with the first five or ten years that I knew the country, as to productiveness, well, now, a person can hardly remember back, you know, eight or ten years. Of course we had failures here. We had considerable failures here four or five years ago in crops on account of hot winds. Yes,
6086 there is very much difference in the years here as to the failures of crops and good crops. These hot winds in July generally injure the crops. But in my judgment as a buyer of stock who has ridden over the country in the general valley of the Arkansas river in this county, I think it is better in productiveness now than it was fifteen or twenty years ago, yes sir.

As to the values of farm lands in this valley at this time compared with the values of the sand lands at any previous time, I would say they are considerably higher now, our lands are around here.

Cross-examination.

By Mr. ASHBAUGH:

6087 My place where I live is just about a mile from the Arkansas river. I live on the north side of Cow creek, and it flows into the Arkansas river east of my place, so that Cow creek is between me and the river. No, sir, I never saw Cow creek go dry. As to there being periods of six months when there was no appreciable amount of rain here, I will answer, we have had quite a dry fall and we have had a pretty dry winter, and it would last six months. At the end of such a dry period as that Cow creek I would say runs from springs. I don't know where they are located. I suppose up along the bottom of the creek. And it maintains a regular flow. There is always water in Cow creek. I have never seen it dry. It

is fed by springs. And other little creeks away above. There is another little creek runs into Cow creek away above and it is fed by the little streams farther up, and by springs. As to Cow creek
6088 being higher or lower than the Arkansas river where it crosses Main street in the city of Hutchinson, I couldn't say whether it is higher or lower.

Since 1872, on an average, I will say that I expect I have seen the Arkansas river nearly every month, and maybe oftener. Perhaps it would average once a month. As to the banks of the Arkansas river having narrowed since I knew it in 1872, I will answer, no, not very narrow. They are not very high banks, they are shallow banks. I don't think that the banks here are nearer together than they used to be. I don't know whether the banks have narrowed between here and Wichita. I have only crossed it on fords—on bridges. Yes, sir, the bridge here at Hutchinson has been shortened. I don't know how much it has been shortened, but considerably. Perhaps 50 or 70 feet. No, it was not shortened 600
6089 feet. I did know how long that bridge was when it was first put in, but I forget now. They rebuilt the bridge, I think. I can't tell how long the old bridge was. It might have been something like 1,800 feet long. I think there have islands grown in the channel of the river in these later years, and it might be a great many islands are now in the channel of the river where there were no islands twenty or thirty years ago. I have never noticed the islands particularly, but I expect that is true. Yes, I think you can see a great many islands in the old channel of the river as you cross the river on the Missouri Pacific railroad bridge going from here to Wichita. I can't tell you how long those islands have been there. Not paying any attention to it, a person can't just remember. I haven't noticed very much about the islands in the
6090 channel of the river there. I don't know that I ever noticed it. I have noticed islands there, but didn't pay much attention to them. I didn't locate them—whether they were in the center or at the outer edge. I don't know about that—as to whether if the water in the river were at the same height now that it had been at years ago there would have been a great deal more water in the river than now. I have seen it dry here in the '70's. But I couldn't say about that. This river is full of water now from bank to bank. It might have been wider in the early days and it might have been shallower. I don't think that the river bed was much deeper then than it is now. As to a great many islands being in the channel of the river and as to whether they would take up
6091 the space of the water, I don't know about that. The river comes down and cuts out and goes from one side to the other. As to whether if it be true that there are now a great many islands in the river with simply channels between them, when the water is at the same height as it was thirty years ago, there will be the same amount or volume of water in the river now as there was then (objection), well, now, that is a pretty hard

question to answer. I couldn't say whether there would be or wouldn't be. I haven't noticed any difference in the water in the river. (Objection.) No, I haven't paid very much attention to it, of course. I have noticed—of course I haven't
6092 seen any difference, so far as I know. I haven't seen any difference. (Objection.) I haven't noticed anything more than it is just the same. I have noticed there has been water in the river in the last three years. We had considerable water
6093 here. Yes, and a good deal of water last year. As to 1903, now, I can't say as to that, whether we had high water then or not. I don't know about the river being dry in 1903 in the fall for a long time. As to the river being dry for a long time two years ago, I will say, no, sir, not that I know of. No, sir, I wouldn't swear to it, but I haven't noticed it. I never noticed it being dry in November, 1903. We have had more rains in the last three years. We have had considerably more rains. But farther back than that—a person can't just remember, you know, about the rains and about how much water was in the river. As to how I came to state on direct examination that there was as much water in the river on an average in the last six years as there was in the earlier times, I will say just because I have crossed it in the earlier years here with shoes on and didn't get my feet wet. Yes, that
6094 was at some dry time. But I didn't notice how much there was in the river the whole year through. No, during some parts of the year there has always been water in some parts of the river at some time in the year, certainly. As to whether or not there has been as much water in the river during the last six years as there was during the dry times of an equal number of years in the earlier times (objection), I will say, well, there has been
6095 just as much water in the river in the last three years as there was in the earlier years, in the '70's—clear back as far as the '70's. As to including the year 1903 in these three years, I would say, well, I don't remember that just exactly.

As to the underflow rising and falling with the condition of the river in the city of Hutchinson here, I will say that I could not tell you about that. I should judge it does. As to the water here in town being nearer the surface when the river has been up for a long time than when the river has been dry for a long time (objection), my answer would be that I couldn't say. Yes, sir, that would be my answer to that without making any special examination
6096 of it. Yes, sir, the crops have been as good the last three years as in former years. I guess we have had seasonable years for the two years here. Yes, sir, the rains have come not only in amount but have been seasonably distributed these last two years. The principal crop on the first bottom lands through Reno county I think is corn. Yes, corn is poor sometimes. As to thedifference and what causes this variation in crops, I will say the hot winds in July. Yes, sir, there have been hot winds in July in the last ten years. The hot winds last year were not so bad. We had some hot winds

last July, but the two years previous to that time we had hot winds that kind of cooked the corn. I couldn't say how deep it is to the underflow on the first bottom lands that are planted to corn in this county, because I never examined it. I never went down to
6097 find out in the first bottom. Right here I should judge it would be eight or ten feet to water. It may be less than that in places. Yes, there are corn lands in this county where it is less than that to the level of the underflow in the low land. We are not on the lowest land right here. As to our being able to raise good corn during the dry years, although there might be no rains, if the river up and the level is near the surface, I would answer, yes, sir, I think so. It has to rain here to make corn. I think we can raise good corn on the first bottom lands here if the river is up. Where the corn gets its moisture during those years, I don't know about that. The low lands, when it is a dry season, raise the best corn. Why, I don't know why it does. I suppose it is sub-
6098 irrigated, I should judge. It would be my opinion that if the sub-irrigation is kept near the surface they raise better corn than when it is down low, but I haven't examined it sufficiently to speak with positive knowledge. As to my testifying in all these matters from a very general and a very limited personal observation (objection), I would say no, sir, I am not. I have had corn out every year on tolerably high land. I haven't had any corn on low land. I haven't had any corn on land that would be affected by the underflow for a good many years. I have never ex-
6099 amined the effect of the underflow upon corn in the bottom lands where the underflow is near the surface.

There is a water mill in this city. It is not run by water power now. As to whether the water power failed so that that mill could no longer run by water power, I couldn't say. I don't know whether it did or not. I know the mill failed, but I don't know whether it was because of the water or the man that had the mill. As to the water power failing so that they couldn't operate the mill by water power, I believe it did. I believe that the water failed on them or they failed. I couldn't say as to that. I couldn't say when that was. It has been ten or fifteen years ago since the mill was running.

Redirect examination.

By Mr. DAWSON:

No, sir, that mill is not on the bank of the river now; it is right up here on Main street in Hutchinson. No, it has not been moved. The building is there yet. They have a wholesale house there. No, sir, the river doesn't run by it now. They filled up the race. They had a mill race dug around from the river and they brought it around and ran it into Cow creek and brought it down Cow creek and ditched it across from Cow creek around this side. No,

sir, the water in Cow creek never failed, but the water they ditched around from Cow creek and made a race on this side of Cow creek about 200 yards this side of Cow creek, right here on Main street. No, they don't run the mill now by steam. They don't run it at all. The mill entirely busted up and quit entirely. As to whether that was because the river went dry or because the business went dry, that the mill quit running, I will say that is a question. I couldn't say about that. Yes, when they used
6100 to bring that mill race from the river they turned the water from the mill race into Cow creek and used that for a way to
6101 carry it. I think they did. They ran it down Cow creek. I should think the mill race likely ran more water than Cow creek. I think they used some of the Cow Creek water in addition to the mill race water to run the mill. They used both, yes, sir. No, sir, I couldn't remember as to the condition in the year they quit running the mill, whether there was water in the river or whether it was dry. I couldn't remember as to that.

Yes, sir, I have seen the Arkansas river dry in the '70's, but I couldn't say as to whether I saw it dry in the '80's. As to whether I knew a time for ten years when it didn't go dry, I would say I don't know now. I expect not. I expect it has likely been dry pretty much every year—pretty nearly dry. It might not have been entirely dry, but very low, a little water running in it.
6102 But whether the year when the mill quit using the water was a particularly dry year or not, I don't know. I guess the mill did run for a while by steam after they quit running it by water power, yes sir.

6103 L. P. HADLEY, Hutchinson, Kansas.

Direct examination.

By Mr. DAWSON:

I live three miles northwest of Hutchinson, in Reno county, and have lived in that locality a little over thirty years.

Yes, sir, I have known the Arkansas river ever since I came here some thirty years ago, and as to the average flow of the water in it, taking it over eight or ten year periods and comparing eight or ten of the last years past with eight or ten of any earlier time since I have known it, as to the volume of water on the average, I would say my opinion is that it is very nearly the same. Of course my observation has not been—I haven't been at it every week, but I saw it every year, probably two or three times.
6104 As to whether I ever heard farmers living along the valley of the Arkansas river in this county in the last ten or fifteen years complain that the river was disappearing or shrinking or getting smaller, I would say no, I don't remember hearing any complaint on those questions, only this, that it was narrowing up and

islands coming here and there; but while it is doing that it is cutting a little deeper, I think. As to the tendency of these islands that grow up in it when there is a flood on to create trouble by making it overflow, I would say, well, it does more than it used to. We have had some floods in this locality within the last year or two on Cow creek. I don't think we have had a river flood, that is, not a serious one. In the last two years we have had an overflow from Cow creek. The river was not high at the time of the overflow.

As to the productiveness of the lands along the Arkansas valley in this county compared now with what they were in the earlier years, according to my judgment as a farmer I would say I think it is as good, considering the weakening of the soil, of course. That is, I think the rainfall and moisture is as good if not a little better than it used to be, for the last six or seven years. But
6105 whether it means to be permanent or reactionary, I don't know anything about that. When I speak of the weakening of the soil I mean the natural weakening that follows the growing of crops constantly on the same soil, yes, sir, that is what I meant, and that is more noticeable where a crop such as corn is continued on the same land without rotation.

As to the values of land along the valley in Reno county now, compared with the values of the same lands in the earlier period since I have been here, I would say they never have been as valuable as they are now, and I think they have doubled in value during the last ten or twelve years, perhaps. The bridge first
6106 built was about 600 feet longer than it is now, I think. Yes, I presume the banks along the river have narrowed in proportion to the shortening of that bridge, all along, yes, sir. As to a good many islands having grown up in the channel of the river, I will say yes, sir, trees and grass have gotten started. There were some islands in it when we came to this country thirty years ago, but there were not nearly so many as there are now, and they were smaller. I should judge that those that were here then have grown larger. I couldn't say. As to what has caused the islands to form, I will say it is the growth of the grass, I think, and bushes and trees, the plum bushes and vines and such things that gather the sand when it is up and it still rises little by little each year. Yes, of course they must have started when the river was low or
6107 dry. I should say that it was about fifteen years since that this has been very much noticed, and I think these islands have been increasing since that time in number and in size. Yes, sir, after these islands got started then the trees and willows began growing upon them, and now they have become quite permanent. I don't remember ever having taken a view of the river from the Missouri Pacific bridge below Hutchinson. I have passed there and have been down to the old slaughter house. I could see the river pretty well from there. As to the river looking like one series of islands with narrow, deep channels between them at the present

time, I will say the last time I was there it was more or less that way, and this began to be noticeable about fifteen years ago.

6108 The river in former years sometimes was dry. Twenty-three or twenty-four years ago it was dry. Perhaps a little water from Salt creek made a little stream that you could step across, but the sand blew out and you could see it three miles away, the line of sand blowing out of the river bed. The river then would hold more, but it didn't come to hold, not very often. As to whether there used to be a greater volume of water in the river then or now if the water in each case was three feet below the Missouri Pacific bridge, that question answers itself, of course. Of course

6109 there would have to be more water then than now, that being the case. In judging of the amount of water that is in the river, as to that being judged largely by the height of the river, I will say yes, sir, that is about the only way we have of measuring it. Yes, sir, when I said to counsel that I didn't see very much change in the volume of water for the last eight or ten years in comparison with the earlier years, I based that judgment upon the height of the river then and now.

Yes, I remember that there was a mill in this city that used to run by water power. As to what stopped the running of it by water power (objection), I will have to explain that a little. The objections to the river water crowding Cow creek with mud and closing up the creek itself became pretty serious and they were almost forced to stop the water or get into trouble. There seemed to be plenty of water to run the mill then. I couldn't say whether there were times in the year when the mill could not run for lack of water. Yes, I think there were times when they couldn't run because of water. After the water power failed, yes, sir, they

6110 ran the mill by steam and water, both. Yes, that is true, that they had to put in steam to supplement the water power. It didn't operate very many years by both; I don't think more than five or six years. Yes, sir, that is correct, that they operated the mill from the time it was first built by water power alone,

6111 and the last five years by both steam and water. They then changed their milling operations. They changed their whole milling operations, and the water power was not sufficient to carry their new process and they put in steam to supplement it. As to whether they had as much water power as in former years, the race seemed to be as full; it was about as high. Of course it was filling the wheel with river mud. It hindered the volume of the water. But they didn't put in the steam power until they put in the roller patent and when they put those in their wheel wouldn't carry them. As to there being water enough in the Arkansas river from 1892 to 1902 to operate the mill as it was constructed during the time when it was operated by water power, they did operate it with what water they had—the creek water and the river water together.

6112 Yes, sir, I have heard about the underflow. As to how far back from the river it extends under the first bottom

lands (objection), well, it reaches under the valley, and I don't know about the high lands, whether it is under that or not. Yes, sir, it does go back as far as the bottom lands. These bottom lands, taking into account Cow Creek valley—and it is nearly the same level with the river valley—are about six miles wide on the north side and about a mile or little over on the south side, I think.

As to the depth to water in these first bottom lands on the north side (objection), I only know about the Cow Creek valley. I
6113 don't know much about the river. Whether the Cow Creek underflow is the same as the river, that I don't know. No, I don't know what the average depth of the water is in the first bottoms along the river. I have not been over there. I don't live over there. I didn't drive any wells or anything of that kind. Yes, sir, I live in the Cow Creek valley, and on the first bottoms there it is three or four feet to water, on the lowest bottoms. (Objection.) As to the water level ever changing according to the condition of the water in the Arkansas river, I will answer, I think it is controlled by the creek and not the river. This water level goes up and down, of course. (Objection.) When the creek is up it goes up a little, and goes down when it goes down. Perhaps the same is true when the river is up or down. I couldn't say.

6114 As to that land being as productive when the underflow is very low for a long period as when it is near the surface, I will say, well, no, not so much so. Yes, sir, that is true, that the productiveness of the land depends somewhat upon the condition of the underflow. As to whether we could raise good crops on these first bottom lands provided the underflow was up, during the dry years so far as rains are concerned (objection), I will say, yes, sir, except that it might be too wet. Sometimes it is. And I will further answer to that, yes, sir, they will raise a crop without rain; that is, those low bottoms. As to whether, during equally dry years so far as rains are concerned, they would raise as
6115 good crops when the underflow was low (objection), I will say, well, that is a theory. We have never farmed those low bottom lands very much, but we have raised crops on them. As to that question, I will further say, well, the crops would not be as good as when there was rain if the underflow was low. Yes, sir, it is about true that if we have seasonable rains we can raise good crops, whether the underflow is up or down. If the rains are scanty and not sufficient to raise good crops, then if the underflow is near enough to the surface to furnish moisture for the crop by
6116 sub-irrigation, it will affect the crop, of course, but not very seriously, on the first bottoms we are talking about. (Objection.) I think it would affect it more on higher lands. On the low lands if the underflow was very high it would be too wet if it rained very much, but on the land just a little higher it would affect it, yes, sir.

As to land values, we have better markets here than we had in earlier years, yes, sir, and better railroad facilities, which have con-

tinued for eight or ten years. Yes, sir, the markets and rail-
6117 road facilities and general development of the whole country of course are probably the reasons or a large part of the reason—the principal part—for the rise in land values. Yes, sir, the town is in a prosperous condition, and our salt industry here has helped it and has added to the value of the lands near Hutchinson. Those things of course have had their effect, and I take into consideration all of these things when I speak of the value of land rising within the last few years or doubling within the last ten years.

Redirect examination.

By Mr. DAWSON:

As to how far back this bottom land I speak of on my own land is affected by the underflow, I should say it is 60 or 70 rods from Cow creek, and in some places narrower than that.

6118 In speaking about the underflow I have been talking about Cow creek. I don't know much about the river underflow, unless they are both the same, and I don't know that they are. I don't know where the ground water comes from. I know it is there. (Objection.) As to whether I have noticed any permanent change in the level of the ground water in my locality since I have lived there, not produced by artificial means, I will say I have the idea that the water level is a little lower than it used to be, but I have no way of telling or giving a reason for it, but that impression has gradually come on me, little by little. As to whether this ditch or mill race that I spoke of used to keep the creek higher running by these lands of mine, I will say yes, sir, that used to keep the underflow higher. It was quite a bit higher during the time that race was in the creek, and since that time it is some lower.

6120 GEORGE FOSTER, Hutchinson, Kansas.

Direct examination.

By Mr. DAWSON:

I am fifty-six years of age and engaged in farming. I have not been engaged in anything else. I was raised on a farm, and I now live five and a half miles east of here and a mile and a half
6121 south, and I have lived in that locality say thirty-three years. Yes, sir, I own my farm upon which I live. I had a claim in the early days right north of Hutchinson about three miles, but I didn't have a deed for that of course. I let that go in 1874.

Yes, sir, I ran a threshing machine and threshed for our neighbors and the people in our township and county and have a pretty general acquaintance throughout my part of the county and between there and Hutchinson, yes, sir.

My lands, that is, my buildings, are three and a half miles from the Arkansas river, but in that valley. I call my lands second bot-

tom. It is just a bench up from the first bottom. I go from
6122 about seven to eleven feet for water. That difference is caused by the formation of the land. In some places where I put a pump for a hog trough it will happen to come in a low place. I put two in that way. And by the house it is higher land.

As to my experience and observation in that locality as to any change in the level of the ground water or the depth to which I have been obliged to go for first water since I settled there some thirty years ago, I have not noticed any difference in putting down wells. I have been acquainted with the Arkansas river for the last thirty-two or thirty-three years, since I have resided in this county. As to the flow of water in the Arkansas river in this county, taking it over a period of six or eight or ten years, as compared with the average flow for a like period of years in the earlier times, I will say that I don't know of any change in it. Of course our changes here—sometimes the river is up and sometimes down. That is, it is up at a certain time of the year and down at a certain time
6123 of the year, yes, sir. But taking it on an average for a group of years, I can't see any difference in it.

As to whether I have ever heard any of the farmers of this county living along the valley of the Arkansas river complain prior to the commencement of this suit that their lands were being made less valuable or less productive by the sinking of the level of the ground water, I would say I never have, nor have I heard them complain that their lands were being made less valuable or less productive because the Arkansas river was disappearing or was carrying less water than it did in the earlier years.

6124 As to the productiveness of the lands along the valley of the Arkansas river in this county, with which I am familiar in later years compared with a like period in the earlier years, I would say, why, it has gained in crops. Our land has gained in production. I should say that the productiveness for the last fifteen years of these valley lands in Reno county as compared with the productiveness of the same lands for the first fifteen years, per acre, on the average, has increased. We get more bushels and better crops.

Our land will gain in corn after corn if we don't trample it with cattle too much. It will gain every year, one year after another; but what hurts the land is putting on cattle, and the wind blowing it off. That is what hurts the soil. There are some places I suppose that have been hurt that way and are less productive. Some special pieces, yes, sir.

I was township trustee a couple of times.

Cross-examination.

By Mr. ASHBAUGH:

6125 I live three and a half miles from the Arkansas river. I can't see any water from my place, no, sir, because there is

too much in the way. I suppose some of the land is in the way. I am on what is called a second bottom. As to my judging of there being more water in the river now for a period of years than there used to be for a period of years, I would say only when I am down at the river is the time that I see it. I can't judge or form any opinion by seeing it from my home place. The only
6126 view I could get was—we calculate that the surface of the water under us runs with the river. No, I can't see it from my home so as to tell how much water there is in the river. The water is from seven to eleven feet below the surface on my place. I have drove wells. As to the water being deeper at one time of the year on my place than another time, I don't know. It don't vary very much. As to why it varies, well, I suppose—we count here that when the river is up the water is higher, because we have an underflow here from the banks on the other side of the river to the sand hills, and I live in between the banks of the river and those sand hills; so that the underflow is beneath my land,
6127 yes, sir. As to the water standing nearer the surface on my land after the river has been up for a few weeks or months than it is after the river has been low or dry for a like period, I will answer, I couldn't say positively, but that is what we suppose, based upon and supported by my wells as far as I have observed them.

Corn is my principal crop. As to that land being as good corn land if the underflow is fifteen feet below the surface as though the underflow was within five feet of the surface, I would say I think it would be. I don't know about that. It may have something to do with the corn, when the corn will be growing. There is
6128 a good deal of our land that is a kind of clayey, hard substance. It is very hard to penetrate it. Some times in putting down a well unless we put it down in a low place we have to dig or bore a hole. Now, it has been so hard that I didn't think the underflow would have very much effect on it. There are places where this clayey or gumbo substance below has prevented the underflow from having any effect on the land, yes, sir. There are places where I dug my cellar of that kind, and I found it
6129 hard, and at those places I don't think the underflow would affect the crop. At the other places where there is no such sub-stratum or gumbo or clay it seems as though we ought to raise a better crop of corn upon land where the underflow is within four or five feet of the surface than though the underflow was fifteen feet deep, and it possibly might be done. As to
6130 the sub-irrigation tiding the corn over the dry part of the year, I will answer, I have seen years when it would hardly tide it over. I haven't farmed any of that kind of soil. I suppose that I have no soil where the underflow is within such a short distance of the surface as to furnish sub-irrigation or moisture. I haven't farmed any of the river bottom. I have never followed corn roots down to see whether they go seven or eight feet to find moist-

ure, but I don't suppose they will do that. During the last
6131 fifteen years on an average I suppose I have seen the river three or four times a year, sometimes oftener, maybe five or six times. As to judging of the amount of water in the river by the height of the water at the time we see it, I will say that is what we generally judge. There is lots of water when it is high, and the height of the water in the river is what we judge by practically, yes, sir. I think the river is just as wide as it used to be, and I think it is just as deep. The channel has changed time and again since
6132 I first came here. Yes, I think the original banks of the river are just as wide between the average flow of the river now as they were thirty years ago, and I think the main channel of the river is just as unobstructed as it was thirty years ago. There is nothing more in the channel to obstruct the flow of the water now than the general washing of the sand, I suppose.

No, I haven't crossed the Missouri Pacific bridge about three miles below Hutchinson, but I have walked across the river a little farther down. I live about five and a half miles below the Missouri
6133 Pacific Railroad bridge. That bridge is one that I don't see often, unless I am taking hogs to the slaughter house. I suppose the channel of the river is obstructed by that railroad bridge. Now, taking it for about two miles below that railroad bridge, I think the channel is as unobstructed as it was thirty years
6134 ago. The bridge don't obstruct the flow of the water, only in the piling, I suppose. These piles are about a foot in diameter, driven into the sand in the bottom of the river, and the bridge is built on them. I have seen the water over those islands. I don't know whether the flow of the last two weeks has been over these islands or not. As to whether if you should go to that bridge and look down the river you would see islands that are above the flow of the river filling up at least two-thirds of the river channel in between the banks as they were thirty years ago (objection), I can't
6135 answer that question. I wish you would talk about a part of the river I am better acquainted with. No, farther down the river about five miles below the city of Hutchinson, there are islands in the Arkansas river. I couldn't tell you how many. There is now and then a little island. And when you get down far enough there are some that are larger than others. I climbed over lots of
6136 them in 1872. I don't think there are any more islands there now. I don't know. (Objection.) I don't know whether they have increased or not. I don't think they have. I have not noticed anything to make me think they have increased. In some places those islands are larger and in some places smaller. No, I don't think the channel of the river is more obstructed by islands today than it was thirty years ago for five or ten miles below the city of Hutchinson. Yes, sir, there are a few trees there, and
6137 there are islands there that you can see by going and looking, and some have grown up with trees. Some of them that had brush on them years ago when I came here—there are

a few of them that have now and then cottonwoods started on them. I don't think that the number of islands has increased. There were islands there thirty years ago. They were high enough to make the water run around them, unless it was as it is now, when we have a freshet, and they showed in the river channel when the river is like it is today, yes, sir. Some would be under the water, maybe, and others would be up. It has been some time since I have
6138 crossed the river five or eight miles below Hutchinson. It has been a couple of years. I get my observation from one side of the river. I don't have to drive over it. The river has cut us off so that we don't associate so much back and forth across the river. But it used to cut us off entirely. Now we have bridges so that we can go, but haven't got into that habit. I don't know that anybody has got any made land in this county from the accretions to the river banks. I don't know anything about it, whether there is or not. I have heard of it in this way—that in all streams where the current turns it cuts out on one side and fills in on the other. I don't know whether this stream has done that.

No, sir, I never owned any first bottom lands in the Arkansas River valley.

6139 I think the first bridge here at Hutchinson was 1,680 feet long. I couldn't tell you how long it is now. It is not as long as the bridge was, but I couldn't tell how long it is. Yes, the lands in this county have gained in production. As to doing better farming than we did thirty years ago, we don't work any harder. We don't work so hard. But we get better crops. I don't think we have any better machinery for corn, and I don't think they have better machinery in general. We have better markets. We have a better plow for a man
6140 who wants to ride to cultivate his corn. Yes, sir, I think the farming thirty years ago was just as good in Reno county as it is today, and I think the class of farmers was just as good thirty years ago as today. Yes, sir, the general farming is better than it was thirty years ago. As to whether that produces better crops, I couldn't say. I suppose so. Yes, lands are more valuable
6141 than they were thirty years ago. We have more railroads and better markets and better facilities for marketing our products, and we have generally developed our county within that time.

Redirect examination.

By Mr. DAWSON:

In speaking of the general notion that what we call the underflow extends from the high ground or bluffs on one side to the sand hills on the other, as to whether I have made any personal investigation to see whether that was true or whether it was just a general rumor in the community, I will say, no, I have not. It is just a general rumor, that is; and as to whether I ever made investigation to

see whether that which is called the underflow comes from the river or whether it in part comes from the drainage of the country to the river, I will say I don't personally know about that. That is the supposition, that that water comes in, and when it rains, as we have some heavy rains now, that water sinks into the ground. As to whether I have personally kept track as to whether the level of the ground water went down with the level of the river or not, I will say that was the general supposition. No, sir, I never investigated to see whether it did or not. I never tested that and don't know about it.

6143 W. B. JEWELL, Hutchinson, Kansas.

Direct examination.

By Mr. DAWSON:

I live in Valley township, about twelve miles from Hutchinson and right on the Arkansas river. My house is half a mile from the river, and I have lived there since 1879. I am sixty-one years of age, and have lived in Reno county thirty-three years. I lived from 1872 to 1879 at Pretty Prairie, southwest of here. I lived there seven years. That place is about eighteen miles from Hutch-
6144 inson. My land faces on the river there, or did at one time, a mile and a quarter. I have 400 acres in my farm. Yes, I been engaged in farming since 1879, with the exception of one year, 1887, when I moved to Hutchinson and rented, and I was out there occasionally during that year. All of my land is first bottom land except about 20 acres and that is second bottom.

Yes, sir, I have had occasion to observe the depth at which one will find first water under the surface of the soil on my land, and if the river is up I don't have to go very deep for water, but if it is shallower I go deeper. I run from five to seven feet. My land
6145 runs three-quarters of a mile back from the river at one place and a mile and a quarter at another, and the distance back from the river where I made these excavations is about half a mile. The ground water shows back that far the effects of the river being high or low.

As to whether there is any difference in the general water level on my place of late years as compared with the general water level in the earlier years, I would say I don't see any difference except when the river is up, and when it is down there is a little difference in it, that is all. Taking the general water level through the last six years on my place, compared with the first six years I was there, I would say that I can see no difference.

Yes, I live close enough to the river so that I can see it, and I do see it practically every day. (Objection.) Excluding any
6146 special dry or wet years but taking a period of six or eight or ten of the years last past and comparing them with a like number of years in the earlier times, six, eight or ten years in the

'80's or in the '70's, as to how the Arkansas river compared in flow in these later years with an equal period of earlier years, I would say I don't know as I could hardly tell, because there were no islands in the river when I moved there and now there are lots of islands covered with timber and I can't see the river like I used to, but as far as the water is concerned, I don't see any difference. Yes, my land is just as good so far as its water level is concerned, in my judgment, today, as it ever was. (Objection.) I don't see any difference, only I don't think the land is hardly as strong, as far as that is concerned. I suppose it is worn out a little more, but in
6147 my judgment I don't see any difference in the Arkansas river as it passes my place down there or passes Hutchinson. It never was a very good river. (Objection.)

As to my ever having heard the farmers along the valley of the Arkansas river in Reno county before the commencement of this suit complain that their lands were being made less valuable or less productive by the sinking or lowering of the ground water or underflow, I would say not to my recollection.

As to the crops on the average that have been raised in this county within the last six or eight or ten years as compared with those raised, on the average, in a like period in the early years, I would say they are just about as good, except, as I said, the
6148 land is worn out a little and not quite so strong and don't grow quite so big stalks. But aside from the natural falling off that comes from the use of the land and the wearing of it, I think the crops in later years on an average are about as good as they were formerly, so far as I can observe, yes, sir.

As to the average price of lands in the valley of the Arkansas river through Reno county compared now with what they were in the past, I would say that prices are getting higher all the time. They are higher. Land like the kind I have is selling down there for about $6,000 to $10,000 a quarter. A man adjoining me sold his half section there for $21,000. Of course he had lots of improvements.

Yes, sir, I know some of the farmers of the Arkansas valley up and down through this country. There are lots of them I don't know yet, but I know pretty nearly all the old-timers. As
6149 to my opportunity for observing the water level, I would say it is by putting down wells and pumps. I have put down pumps and pulled them up and sunk them again in another place every year or two. I have had to change my lots sometimes for hogs and cattle and have had to move the pump. You have to dig to water, almost, before you drive. You can dig to water in about half an hour and drive from that on and put on the cylinder. You want the cylinder below freezing ground. Yes, sir, by making an open excavation or by the digging of a hole I have been able to judge of the underflow in the late years and the earlier years. That is the way I found out.

Cross-examination.

By Mr. ASHBAUGH:

The nearest part of my land is right on the bank of the river, and the part farthest back is a mile and a quarter. My land is all on the river but about twenty acres. At one time it was about a mile and a quarter up and down the river, but I have given one of the boys a piece of land in there and that takes off half a
6150 mile. Of course my land in some places is closer to the water, but then the water level, there is no change in that. In some places it is a little lower ground than in others, and some parts of the ground is higher than others, and the depth to water on the highest place is greater, yes, sir. It is about seven feet at the highest, except when it strikes the upland. The lowest place is only about eighteen inches to two feet to water. The water is practically level under my land. That is the way I find it. Yes, sir, and it corresponds with the level of the water in the river, and I know when the river is full, at them low places the water will soak up long before the bank gets full of water. That is the way I find that the water is level underneath. Then after the river has been low or dry for a long time, of course, when the water goes down the underflow sinks a little. That is the reason I said it was from five to seven feet according to the rise in the river. These same conditions exist everywhere in the Arkansas valley so far as I know. I know nothing about any other place only my own.

6151 The crops that I raise are wheat, oats, corn and alfalfa. During a year when the rainfall is scanty I could raise better corn if the river is full than though the river is dry, if the hot winds didn't burn it. If there is too much water it will kind of drown the corn and make it yellow; it don't mature good. And provided there was enough water in the river to get sub-irrigation. By this sub-irrigation I mean when the river is full that flow of water underneath is stopped from running off by the river water holding it there, and that is what soaks up in them low places before it runs over the bank. That is what I call the underflow, because there is water under there all the time. As to whether the sub-irrigation makes my land more productive when there is not sufficient rainfall to mature a crop than though the river was dry and the sub-irrigation was very low, I don't think it would. As to whether I could
6152 raise just as good a crop if there was no water in the river at all as I could if the river had water in it, when the rainfall was scanty, I would answer no, I don't think I would. In answering your previous question maybe I didn't catch the question just right. If the river had a good flow the land would be more productive than though there was no water in the river, close to the river, but not so far back because sub-irrigation would make that crop close to the river but it wouldn't reach clear
6153 back. As for raising a crop, I depend upon rainfall. If it don't rain I don't get any crop, unless there is water in the

river, plenty of it, and I depend upon this sub-irrigation to mature my crop some but not altogether. If the rainfall is not sufficient to mature the crop and the river has a good flow of water in it, we don't always get a crop. We get part of a crop sometimes. Well, if there is plenty of water in the river, that is, pretty nearly banks
6154 full, we get better crops than if it rains too much. Yes, during dry years the productiveness of our first bottom lands depends to a large extent at least upon the condition of the river, and that is because of our sub-irrigation. During a dry year if the flow of the river is good the sub-irrigation furnishes the same moisture for our crops, yes, sir, but I don't know as it furnishes enough to make a crop. (Objection.) The productiveness of our soil in a year when there is not sufficient rainfall to mature a crop depends upon the sub-irrigation, except what little rain we get. (Objection.) Of course we have to depend on the sub-irrigation. Yes, sir,
6155 the higher the sub-irrigation is in a dry year the more moisture we get and the better crops we have as a result. Yes, sir, I said that when I moved onto that place years ago there were no islands in the river. Now there are a good many islands in there, and they are covered with timber. The banks of the river have filled in in one place and washed out in another. They washed back on one side about the same as they filled in on the other. The river is not getting narrower where I live. Yes, sir, I have known of some people getting land by accretion along there. There is a piece on my boy's place which I gave him there—there is about twelve acres there, but on the other side it washed off about that much. Yes, the main banks of the river are about as far
6156 apart as they were thirty years ago. Probably there is more made spots in it there that when the river rises so high it gets over them, but as to the main banks, I don't see as there is any difference. Leaving the islands in, the carrying capacity of the river is not as great today as it was thirty years ago, with the water at the same height. No, the carrying capacity of the river today and as it is and has been for the last few years is not as great as it was twenty or thirty years ago, with the water at same height. As to when those islands began to become permanent and noticeable, I couldn't tell you the exact time, but it has been at least eighteen or twenty years. No, for the amount of water that might be carried
6157 the river is not as good a river as it used to be, if that is what you call the "good" part. (Objection.) I couldn't tell as to what proportion of the original width of the channel is now covered with these islands, but I suppose probably one-eighth or one-tenth or somewhere along there. I don't think at my place it covers one-half of it.

Yes, sir, I know where the Missouri Pacific Railroad bridge is below Hutchinson. I have not crossed it lately; it has been years. I haven't seen the river below that bridge lately as I know of, so I don't know anything about its condition there. I was at Wichita

on the Missour Pacific Railroad bridge a few weeks ago, but
6158 I took the train at Haven. You can't see the river along there from the railroad, not until you get to Wichita. Haven is back five or six miles from the river.

Yes, sir, I spoke of the lands being higher. Oh, yes, there are better improvements on the land now in Reno county than there were thirty years ago, and better markets, and then the land rises because it is scarcer. In judging of the price of land I would take all of these things into consideration, and men do so in general, yes, sir.

Redirect examination.

By Mr. DAWSON:

As to any evidence on my first bottom land that the Arkansas river has at any time in the past had old channels cut through it, in that there are low places or swales that show that some time long ago the river had perhaps run through part of it that it don't run through now, I would say that I have found these little swales in the land there, but I never knew how they got there. Well,
6159 there are none on my place, but below me there is a little draw. I don't know as the river has run through there. There is a kind of a slough there.

As to the sub-irrigation I spoke of helping my crops in dry years when we didn't have enough rain to produce a corn crop, I will say that it helped, principally close to the river. (Objection.) I should say that the effect is noticeable not over 80 to 100 yards back from the river, unless you strike a low place that has washed lower than the other. The crops will be better there. They will be green when it is yellow somewhere else where it is higher. As to those low places catching what little surface water drains into the country as well as possibly drawing some from the river, and as to whether they fill up or get wet quicker when it rains and stay wet longer, I would say, well, yes, but mighty little, unless it is a big
6160 rain, because it is sandy soil and it don't hold. Oh, yes, there are times when this land 80 to 100 rods back from the river is too wet for a good corn crop. Such a time was last year, when Cow creek was up here and ran down through there, when there was plenty of water in the river and it couldn't soak away, and so drowned out a lot of wheat and corn. Yes, sir, Cow creek came into a full river, and both together made too much water.

Taking it on an average over thirty years on that 80-rod strip, as to whether sub-irrigation is more advantageous, or more harm by being too wet when the river is high, I would say I don't know how to take that on an average. Some years if it is too wet I don't raise much, and if it is too dry then I raise more. But most of that ground where it is so close there is grass land—meadow.

Recross-examination.

By Mr. ASHBAUGH:

No, hay land has not been getting better in the last fifteen years. Yes, sir, I said that in the low places where the sub-irrigation back from the river is near enough to the surface the crops would be green when they would be yellow all around them in a dry time. That shows that those places are closer to the underflow.

6161 As to how far back that extends (objection), I have never farmed as far as three or five miles back from the river, and I was speaking of those places being on my own land. My hay land hasn't got any worse during the last fifteen years.

6162 A. N. CULBERSON, Hutchinson, Kansas.

Direct examination.

By Mr. DAWSON:

I live out twelve miles south of here on the Arkansas river. I have been thirteen years where I live now, and have been right there in that neighborhood since 1887 and have been engaged in farming in one way or another all that time. Yes, sir, I own 80 acres on the river, but it doesn't run right down to the river exactly. The southeast corner of it is about a hundred rods from it. But I would call my land first bottom, but some of it near the center is higher, sandier land than that. It is what they call the first bottom,

6163 I guess. As to the crops raised there in the last nine years as compared with the first nine years I was down there, I would say right in there it don't appear to me the corn has been so good in the last four or five years as it was before, right in that neighborhood. It don't appear to me as though they had as good corn. Well, I think the cause of it is lack of rain. But taking a longer period, say splitting the eighteen years I have been in that locality into nine year periods and averaging the first nine years with the last nine years on the general crops, I would say I don't know as there is much difference, except four years ago when nobody had anything. Yes, that was a drouthy year. I think it was four years ago there was no corn raised there much at all anywhere around.

As to the condition of the river having any effect on my crops, I would say I depend on the rains myself. Yes, sir, I have

6164 noticed a difference in the crops on my land when the river is high or when it is low a hundred rods back. I have noticed when it was so high that I couldn't get in to attend to it, that is, Cow creek and it together. As to whether when we have a dry year and haven't any rain I gain any advantage from the river, I would say four years ago is what I would call a dry year, when

we didn't raise anything, and the river that year was like it generally is, I guess.

No, sir, I can't see the river from my house, but I can from my place, yes, sir. As to the average of the river in the last eight or nine years I have been there compared with the first eight or nine years, I would say I don't see any difference. It gets low and gets high just as it always has since I have been there.

As to the values of land in my locality now compared with what they were when I first came to the country, I would say they are higher, considerably. As to whether or not before the commencement of this suit I ever heard any of the farmers along the Arkansas river complain that their lands were being made less valuable or less productive because the underflow or ground water was sinking or getting away from them, I will say no, I don't know that I did. I have no recollection of hearing any complaint of that kind.

Cross-examination.

By Mr. ASHBAUGH:

6165 As to the first time when I heard this underflow spoken of, I couldn't say when I heard it first. Most ever since I have been here, I guess. They call it, I think, the underflow, or sub-irrigation, and I mean by that the water that comes out from the river and rises up. I have taken it to mean that. As to when it rises up under my land, I will say whenever the river rises. As to whether it stays up as long as the river stays up, I will answer, I guess it does. Whenever the river begins to go down the water backs out. As to how deep it is to the level of the underflow
6166 under the greater portion of my land, I will say when the river is down it is farther to it—four or five feet, probably. I don't know just exactly. The time that I said I couldn't get in to cultivate my corn, there was a flood in Cow creek, yes, sir. I couldn't say whether Cow creek is supplied entirely from rain or not. I suppose the floods in Cow creek come from that source. Oh, no, the floods coming from Colorado can't get into Cow creek, and I suppose local rains in Kansas supply the floods in Cow creek. As to how deep it is to the level of the underflow on my land when the river is up, I will say if the river gets high enough the underflow overflows on top of the ground. It is low land. As to how
6167 deep it is to the level of the underflow when the river has been dry for a long period of time, I will say I do not know. I guess as near as I could tell in the driest time you could strike the water there from five to six feet. When the underflow is five or six feet below the surface, as to whether that is as good a corn year as when the underflow is nearer the surface, I will say, I don't know. I never could say that I ever got anything out of that underflow at all; but it is there when the river is up. Yes, sir, as to whether you get any benefit out of the underflow depends somewhat upon the land. I have noticed that I had better crops from rain than

anything else. As to how far back from the river the under-
6168 flow entends (objection), well, I couldn't say. I have never put any wells down any farther back from the river than where I live, and my observation is mostly confined to my own piece of land. As to other pieces of land around there, I don't know how far it would be to water. Yes, sir, during the eighteen years I have been down there the river has sometimes been high and sometimes low. No, I don't know as it has been low for a longer period of time since about 1890, prior to the year 1904, than it was during the first years that I know it. I have paid no attention to it. It is just up and down as it always has been.

Yes, sir, there are islands in there now, and there were some when I came there. When I came here there were sand bars, we called them; now they have grown up in timber and grass. I couldn't say how much of the original channel is covered by these islands
6169 now. They are just small islands, and some big ones, and little streams running in between them. Yes, sir, there are places along there that they call made land, but I suppose if the land is filled in the river is not as large as it used to be. I never crossed the Missouri Pacific Railroad bridge just below Hutchinson. I don't know that I have noticed the river at all between my place and Wichita until I get right to Wichita. I might have seen it and not thought anything about it, you know. It has
6170 been quite a while since I went down there. I have never seen the river more than two or three miles below where I live, and as I went to Wichita on the train, I paid no attention to the river at all. (Objection.) As to whether there is as much water flowing on an average now as there was in the earlier years, I think there was about the same. If it would go plumb dry I would be apt to know it, and when it runs over the banks I know that, but I have paid no attention to it outside of that. Yes, sir, that is about all that I have paid any attention to, was these two extremes.

WICHITA, KANSAS, May 9–11, 1905.

6171 D. M. SPRANKLE, Wichita, Kansas.

Direct examination.

By Mr. DAWSON:

I live about four miles northwest of this Federal building, in
6172 Sedgwick county, Kansas, and I was subpœnaed to be present at this hearing. I have known Sedgwick county in this locality since the summer of 1875. I have been engaged in farming in this locality where I am now residing, and I have had that farm since January, 1876. It consists of 160 acres and is situated about a mile and a half from the Arkansas river on the first bottom.

When I first occupied the place in 1876 there was one or two wells upon it, but I don't remember of having put down any wells during that period myself. I am located on the west side of the river, and I do my trading and attend to my business which requires attention in Wichita, yes, sir. In going to Wichita I cross
6173 the river usually on Thirteenth street, and have been doing that for the last ten years. Prior to that time I crossed the river on the Douglas Ave. bridge. Probably I saw the river during the later '70's, from 1875 to 1876 on, not oftener than once or twice a week. (Objection.) Between 1870 and 1875 I crossed the river on the Douglas Ave. bridge. There was no bridge on Thirteenth street at that time. And during the last ten years I have been crossing it on the Thirteenth Street bridge. I have seen the Arkansas river
6174 in Sedgwick county more frequently in the last ten years than before that. (Objection.) I should think the Thirteenth Street bridge was about a mile above the Douglas Ave. bridge.

As to the flow of the water in the Arkansas river where I have seen it in this county for the last five years as compared with the flow of the river say for the first five years I knew it, from my observation I can't say that I have noticed any material change. (Objection.) As to any change in the water level on the place which I own, of the ground water there, in late years, compared with its level in former years—not referring to temporary or local changes
6175 from day to day—I would say there has been no change in the water level to the best of my knowledge and belief. A portion of the land I own has been farmed since 1876, and it has all been in cultivation during the last fifteen years, as near as I can remember. Aside from the natural deterioration which comes from the constant farming of lands, as to the productiveness of my land now and for the last five or ten years, compared with its productiveness in earlier years, I would say some crops do not grow as well, principally the wheat crop, but I can't say in regard to corn. I think the land produced better crops of wheat when it was new than it does now. I believe that is usually the history of the wheat industry. (Objection.)

6176 As to whether before the commencement of this suit I ever heard any of the farmers along the valley of the Arkansas river in Sedwick county complain that their lands were being made less productive or less valuable by reason of the lowering of the general water level of the country (objection), I would say that I have heard them complain or say that they believed that if Colorado didn't take the water from the river but that if it was allowed
6177 to flow through this State we would have better seasons and more rainfall. But as to your question, I think not. Now, as to having heard them give any reason as to why they would have more rainfall or as to what effect they thought the flowing of the river would have upon the rainfall, I would say their idea was that if there was water in the channel of the river the rain

would be attracted by that moisture. No, sir, I have not seen that theory advocated in the "Wichita Eagle." Yes, sir, I take the "Eagle." Yes, it has given considerable discussion to the advantages to be obtained by the people of Kansas by the stopping of the irrigators in Colorado, but I have never read them to any considerble extent.

As to the value of the valley farming lands, including first and second bottoms, in this locality, compared now with former years, I would say both grades of land have increased in value and the market price is higher now than it has ever been since I have known it. (Objection.) Yes, sir, between the years 1880 and
6178 1895 I was absent from Sedgwick county. I was living at Lawrence, Kansas, and was in the employ of a real estate and money loaning company. I was its secretary, and in a general way my duties required me to pass on securities offered the company.

Cross-examination.

By Mr. ASHBAUGH:

Yes, sir, I located in Wichita in 1875. I went into the country and boarded with a farmer about three miles west of Main street on Central Ave. I was inspecting securities for a farm mort-
6179 gage company. I bought the land I spoke of in January, 1876. It is a mile and a half from the Arkansas river and about two miles north of Douglas Ave. I lived there between four and five years, and then I went to Lawrence and stayed there until 1895, and then I came back to my farm and have lived there ever since. Yes, sir, I have taken the "Wichita Eagle," but I have never read those discussions carefully.

6180 No, sir, prior to the bringing of this suit I never heard of any meetings being held by any of the farmers of Sedgwick county in the city of Wichita. No, sir, I don't know of any association that was formed here and that held different meetings and that advocated the bringing of this suit or some other kind of proceeding to protect their interests. I never knew how the suit started. I have paid very little attention to it. No, I don't know Mr. Oldfather, nor Mr. Harrison, nor Mr. Rutledge. I never heard anything about either of them in connection with the agitation of this question.

As to the productiveness of the land and what we depend upon for the production of our crops, I will say, good cultivation. The water on my land is from twelve to fifteen feet below the surface. No, sir, that depth does not always remain the same. As to what changes it, it varies a little with the river. As to an explanation for that, there is a stratum of water underneath the Arkansas
6181 valley that we call the underflow. That stratum is affected in some way by the quantity of water in the river. As to how it is affected by the quantity of water in the river (objection)

I presume this stratum of underflow is supplied to some extent by the water from the river. Whether it is all formed in that way or not, I don't know. As to the effect of a full river upon this underflow, it will cause the water to rise in the well pipes. As to what effect a dry river has upon the underflow, I will answer, it falls to a certain extent. How much, I couldn't say. No, sir, I have never had any open wells upon my premises so that I could examine them so as to give any positive information upon that point. Yes,
6182 sir, I was gone from this community for something like twelve or fifteen years between the early '80's and 1895, with the exception that I visited my farm about once a year. No, I didn't raise any corn on my premises in those early years myself. As to the width of the river between my place and the mouth of the Little Arkansas river (objection), I don't think there has been any change at the bride on Thirteenth street. The channel, however, is not so wide at Douglas Ave. as it was formerly. Thirteenth street is the only point at which I have examined the river. All I can see of the river from my place is the timber on the river. There is an island at the Thirteenth Street bridge. (Objection.) It extends
6183 above the bridge and below the bridge. I don't know of any islands in the river channel above that. I haven't paid any attention to that. I presume I saw that island under the Thirteenth Street bridge the first day I crossed it. There has been no change in that island since I first saw it. Yes, there were small trees on it then, young cottonwoods. As to when I saw it first (objection), I can't say positively when I saw that island first. I can't say whether that island is larger or smaller now than it used to be. (Objec-
6184 tion.) There has been no material change in the size of the island. No, I never paid any attention to it so as to determine that question.

Yes, sir, I crossed the old wooden bridge at Wichita. I don't know definitely what is known as Ackerman's island there. I know about the locality of it, and I presume I have seen it. It is impossible for me to describe Ackerman's island. (Objection). I have never noticed it with enough care to be able to state what it is like now, or was like formerly. I have paid more attention to the
6185 river than I have to the islands. (Objection.) I may cross the river and notice the river and pay no attention to the islands. I don't know, sir, whether there were any trees on Ackerman's island when I crossed the Douglas Ave. bridge the first time or not. (Objection.) Yes, there are trees now on Ackerman's island if they haven't been cut down recently. (Objection.) I
6186 crossed the Douglas Ave. bridge today in coming to town. No, sir, I didn't notice whether any trees had been cut down on Ackerman's island within the last two years. As to whether the trees all along the lower end of Ackerman's island and just above the Douglas Ave. bridge have all been cut down within the last two years, I will say I don't know, sir, I didn't notice it. I don't know whether Ackerman's island is larger than it was when I saw it first.

I presume Ackerman's island was a mere sand bar thirty years ago and could only be seen during low water.

As to land being higher, yes, sir, there are better improvements all over the county than there were thirty years ago. Wichita is larger and has better markets, and the country here has gen-
6187 erally developed in all directions during the last twenty-five years. Between the early '80's and 1895 I visited my farm once a year. I know where the water level was when I was here between 1875 and 1880, and I know where I found it when I returned in 1895. As I remember it, 1895 was an average season. During a wet year the water level is higher than during a dry year. The numbers of my land are, the southwest quarter of section 11, township 27, range 1 west.

6188 W. F. STEVENS, Wichita, Kansas.

Direct examination.

By Mr. GREGG:

I live at present at 1119 North Main street, Wichita. My business has been farming, all my life, but I am a retired farmer now. I came to Sedgwick county in December, 1870, and located in the corner of Union township, south of this parallel, six miles west of the 6th principal meridian. That is about sixteen and a half miles northwest from Wichita near the town of Maize, and Colwich is five miles from my south line. It is six miles from my place. I have homesteaded 175.97 acres, according to
6189 the patent, and I still own that place. I lived there continuously since 1870 until I came to town here in 1901, and I still own it. When I farmed I did it myself. It is now rented, but I am still looking after it. This land is located right on the river. The river cuts off the northwest corner. It is bottom land. My house is half a mile from the river, and I lived there about thirty years and was up and down the river quite often in those early days, yes sir. Yes, we could see the river from our house for a number of years after we settled there, and I crossed it
6190 quite often in those early days. No, I have not kept in close touch with the condition of that river in late years, not within the last few years. As to the flow of the Arkansas river in those early days, as to there being high water, low water and dry periods, I will say there has always been high water, I think, every year since I have been there, and low water too. Yes, sir, it ran dry during those early days (objection), in the fall; and that was a matter of general occurrence, yes, sir. (Objection.) Taking the flow
6191 of the stream in those earlier years for a period of ten years as compared with periods of ten years at a time from that until the present, I would say the river gets higher now then it used to. At least it overflows more than it used to. As to other times, I

would say I can't tell any difference. So far as my observation goes, it is practically the same, taking a cycle of ten years from one time to another from the early days to the present, yes, sir. It went dry in those early years. But there were some holes along in the river. In 1871 and 1872 we found a whole lot of fish in those holes. It was a fine place to fish there in 1871 and 1872. No, there are mighty few fish there now, and as to accounting for that, I will say the people claim it is the dam down here at Oxford. I don't know. I can't swear there is a dam there, but that is what they tell me. That dam was built there in an early day, I guess. That is

6192 my understanding.

I can strike water at from four to six feet most anywhere on my place, in the early days or now. I have noticed that if the river is up I don't have to go so deep for water; if the river is down I go deeper. But as to there being any falling of that water level there so far as I know, I will say I don't think so, only, as I tell you, in a dry river. I think it rises and falls some with the river. I think so. It gets higher when the river is up and falls some when the river falls to a lower stage, yes, sir. But so far as my observation and knowledge go I haven't noticed any difference in what is called the underflow as to its level. No, sir, I can't see any

6193 difference. Yes, sir, I think I am well acquainted with the farmers up and down the river along the Arkansas valley who have bottom lands, and I am generally acquainted with those who have valley lands farther back from the river. I don't know all of them here up as far as I live, and maybe up at Hutchinson I don't, but I know a good many of them in my neighborhood for some miles up and down the river, yes, sir.

As to my ever having heard any of those farmers in the vicinity up and down the river prior to the bringing of this suit complain that the flow of the water underneath had fallen so as to injure their crops or lands, I will say, no sir. I would say not. As to having heard among those farmers complaint to the effect that their lands have been injured in value by reason of any falling of this underflow, before the bringing of this suit, I would say I don't believe I have.

6194 I raised on my land corn, wheat, oats and potatoes, and I think the crops are as good now as they ever were if the season is favorable. We raised poor crops before, in the early days, and we have raised better crops since. I attribute the loss of crops in those early days to the dry weather, and I attribute the loss of crops now to the dry weather.

As to the value of lands, both as to mine and lands in that vicinity along the river there, comparing the present with earlier years, I would say lands are getting higher all the time. They are higher now than ever before, yes, sir. (Objection.)

Cross-examination.

By Mr. ASHBAUGH:

Yes, sir, that is right, I said that sometimes we raised a good crop and sometimes we didn't. What determined that was want of moisture—rain. As to whether if the underflow was up we
6195 would raise better crops than though the rainfall would remain just the same but the river was dry and the underflow was down, I would answer, I would rather risk the moisture from above than below. I have seen vegetation burnt up when the river was up, right close to the river. We can't raise a crop without rainfall. As to whether the underflow influences the production of our lands during a dry year from lack of rainfall, I will say I don't know how to answer that. As to whether the underflow influenced the productiveness of my lands during a year that was dry from lack of rainfall, I will answer, well, we can't raise a crop without moisture. I will answer it that way. If there
6196 is not sufficient moisture from rainfall we don't raise a crop. As to whether my land is more productive with the underflow near the the surface than though the under flow was low (objection),I will say I can't answer that; I don't know. As to whether the underflow influenced the productiveness of my lands during a dry year from lack of rainfall, I will say probably it did. There would be more moisture. We didn't have the higher underflow in a dry year. Yes, we had dry years from lack of rainfall. As to those years, if there was a plentiful supply of flowing water in the river, as to whether the land along the river would be more productive than though the river was low, I presume it would be if it was that way, but it was not that way. It has not been that way all
6197 the time since I have been there. I can't answer whether the river was dry in the early years as long as it has been dry in the later years. I never took any notice of it, nor of the dates. Yes, we used to have periods of high water and of low water, and the periods of high water were sometimes longer and sometimes not so long. Sometimes they lasted two or three days and sometimes two or three weeks, and have lasted two months. We have had high water as late as August, and during the balance of the year we would be liable to have low water. I believe that the periods of low water in the river were as long each year in the early years as they were from 1890 to 1901; but I didn't state any time. In 1874 we
6198 thought it was dry all season. Yes, 1874 was an extreme year. It was the grasshopper year. I don't recollect about 1879. No, I can't mention any extremely dry year in the early history of the valley excepting 1874. We have had dry years, but I can't tell you what years. No, the water gets higher now than it used to. It overflows more by my place than it used to. Yes, sir, I judge of the fact of it being higher water now by the fact that it overflows my place worse than it used to. Certainly the water gets higher in the river now than formerly. No, the river is not as wide

at my place as it used to be. There used to be islands along there, and there are some there now—small islands. I can't tell whether they are getting larger. Yes, they are growing over with trees and brush, and the chances are they are getting larger. Yes, it looks from my place down to Wichita that the islands are getting larger. I can't answer as to whether there are more of
6199 them. I can't say that the old channel of the river as we used to know it now looks like an archipelago from my place down to the mouth of the Little Arkansas. It didn't look that way last summer. When the water was at a certain stage it probably would look that way, but when it was up it didn't. Yes, sir, last summer was a very wet year and we had a very high flood the first of July, the highest flood since twenty-seven years ago. Yes, sir, since I have been in this country there have been two extreme floods—one in 1877 and the other in 1904. As to whether they reached about the same height at my place, I couldn't an-
6200 swer. I was not there last year. I saw the flood at Wichita twenty-seven years ago also, but I couldn't tell any difference in the height.

Yes, I remember the Douglas Ave. bridge in 1877. I don't think the flood came up to the bridge in 1877. I don't know how much it missed it; I don't know how far it was from the floor. Yes, I think it is about right that that flood would allow a tree or a floating substance to just pass under the bridge without scratching it. Yes, sir, that is about the same condition as the flood of 1904. Yes, sir, I think that is correct, that the flood of 1877 came just about as near the Douglas Ave. bridge as the flood of 1904. As to whether there was as great an amount of water coming down the channel of the river in 1904 as there was in 1877 (objection), I will say
6201 I can't tell that. I can't tell whether there was any difference in the height of the bridges. I can't tell you whether the second bridge was built exactly the same height as the first one. I have crossed both of them many times, but I don't know the height of them. I should say the bridge now is not as long as the bridge was in 1877. How much shorter, I don't know. If the testimony shows that it is 300 feet shorter and the water came to the same height and the bridge is the same height, then as to whether there would be as great a volume of water passing down the
6206 channel in 1904 as in 1877 (objection), I will answer well, I would say not. It couldn't possibly be. You couldn't press the water in.

As to the banks having narrowed up along my place since I first knew them, I will say, east of me I think it has narrowed about one-half, that is, on the south side, and the north bank has remained about as it was in 1877. West of that the north bank has filled in and the south bank has remained the same.

Yes, sir, I know Mr. Harrison. His place is about two miles from mine. One of those places that I have just referred to where the river is filled in is east of him, yes, sir. He lives just

above me. As to the old river channel as I recollect it in 1877 being as deep on an average from bank to bank as it used to be,
6203 I will say, I can't tell you, I havent measured it exactly. I can't tell that there is any difference. It don't look as though there was any difference, but I can't say that there is not. I can't tell that there are any islands in the river now that were not there in the early '70's.

Yes, sir, the underflow does rise and fall practically in harmony with the rise and fall of the river. I can't tell how far back that extends; I never tested it; but it does go back as far as I know and does go back under my land at least. Yes, sir, sometimes some of my land is two wet to cultivate. It drowns my crops. As to my being bettered by having the river lower at all times (objection), I
6204 will say, well, no, I will not answer that. I can't answer it. It might be possible to have some crops drowned out, and it might make me more crops in some places.

As to my having heard any discussion of this matter before this case was brought (objection), I will say the chances are I have. I will not say positively I have, but I surely have. There has been a whole lot of talk about this case, and it must have been talked of before there was a suit entered. Well, I believe I have known of farmers up in that section holding meetings here in Wichita two or three years before this suit was begun. I don't know that; I have heard it. I wouldn't say what the general discussion was that was carried on at those meetings. I never attended one of them. Yes,
6205 sir, I know Mr. Oldfather and Mr. Harrison and Mr. Rutledge. Yes, sir, I believe Mr. Rutledge was at my office to talk with me. (Objection.)

6206 As to land values being higher now, I will say there is a whole lot of difference, and there is a difference in the markets and facilities for transportation and everything of that kind. There is some better farming in this county now than there was thirty years ago.

As to how the carrying capacity of the river at my place, with water in each instance at the same height, up to the top of the banks, compared now with its carrying capacity thirty years ago (objection), I will answer, I stated that the river didn't have a capacity to carry off the water now that it once had at my place, and I thought that caused the overflow. If the same amount of water in bulk should come down the river now that did thirty years ago, I guess it would do more damage now than in the early years, yes, sir.

Redirect examination.

By Mr. GREGG:

6207 Yes, sir, I know of instances where parties have filled in an old or side channel and connected by that means the mainland with the island so as to make the land fill in and make the island a part of their land. There is one place right north of my

place. There was an island there of five or six or seven acres, probably, more or less—I would say more—and there was a channel between that island and this man's land. That island had six or seven acres in it, and he added brush and rubbish and one thing and another and filled it in there, and hauled straw and other things and filled the channel up, and that island is attached now to the mainland. That would narrow up the channel of the river, yes, sir.

6208 As to the fact that people living along the Arkansas river near where those islands are have shown a readiness to attach the islands in that way to their land (objection), I would say, that is correct.

Recross-examination.

By Mr. ASHBAUGH:

I think they did that for personal gain, I would say. I don't know of anything else. As to whether the amount of water has been less in the river because they did that or whether they did that because there was less water in the river, I can't answer that. I can't state how long ago they began such work. Quite a while.

6209 Perhaps ten or fifteen years ago or longer. Yes, the islands that were disconnected from the bank then are now connected with the bank, and this land that has been filled in there has grown over with trees. They did that for personal gain, I would say. I don't know. I just guess at that. These places don't wash out in later years because it is protected, I guess, because there isn't enough water comes. I don't know of anything else. I can't say that I know of any islands that have been connected with the river bank where there has not been any artificial means used. I don't know. There may be some.

6211 J. R. FOSTER, Wichita, Kansas.

Direct examination.

By Mr. DAWSON:

I live in Wichita, and have lived in Sedgwick county for thirty-five years today, and have been acquainted with the Arkansas river for that length of time. I am fifty-eight years of age, and at present am doing nothing. I have always farmed, but now I am a retired farmer, living in Wichita. Yes, sir, I still own the original land that I took up on the river; that is, 160 acres. This is located east of Maize two and a half miles. That is about nine miles from

6212 Wichita. The closest of this land on the south side is fourteen rods from the river, and it runs back to eighty-five rods. It is all bottom land. There is no real first and second bottom, it is just all bottom clear across there. Yes, sir, I settled there in the spring of 1870, and I continued to live there until five years ago,

and during the last five years I have visited the farm from time to time, sometimes once a month. My boy lives on the farm, and I frequently go out. No, you can't see the stream very well from my farm. We are looking squarely across the river, and the banks being high, it is a hard matter to see the stream. Oh, yes,
6213 we can see where the water is, certainly. We can see the stream at the bend or a little above it, on our farm, yes, sir. As to the flow in the Arkansas river for the last eight or ten years, taking it as a whole and averaging it up, compared with the flow of the stream say for the first eight or ten years that I knew it, I really can't say (objection) that I paid any particular attention to it, but just from common observation I haven't noticed much
6214 difference. Well, I have noticed as a matter of course it is sometimes higher and sometimes lower, and it has been that way ever since I have been there. In some years there is less water and in some years more. (Objection.)

I have had no open wells for a number of years on this land, but in the earlier days I dug open wells and could get water at
6215 four and a half to five feet. I really have no knowledge of the general water level of the country—the ground water or underflow. I have paid no attention to it or how it compares. I have never dug down to find out so that I could state. (Objection.) As to whether I have observed anything that would indicate or lead me to believe that there had been any change in the
6216 general water level under my land, I would say no, I believe not. As to whether I ever heard the farmers or my neighbors along the valley of the Arkansas river in Sedgwick county before the commencement of this suit claim their lands were being made less valuable or less productive by reason of the sinking of the water level under the ground, I would say (objection), I don't know that I did. Of course I have heard some talk, too, about this at the time the suit was brought. As to whether I ever heard anybody make a statement of that kind, well, I think I have. I think I have heard them speak of it in that way, but I couldn't say as to whether that was before the commencement of this suit or not. It was several years since I heard them talk about it.
6217 Of course when the river was down very low in the summer time it certainly had a bad effect on crops along the river. Whether it was caused by the taking out of the water, that of course I don't know anything about, but it did affect the crops, I believe. I don't know how much farther back than the land right along the river they would notice it. I think, as I say, I have heard people speak of it. I believe that is a fact, in that way.

As to whether it is true that in talking with your associate, Mr. Gregg, in the presence of Mr. Stevens and Mr. Malone this morning, I said I had never heard any complaint of that kind before the commencement of this suit (objection), I would say of course I don't know what I said to him, but the best of my recollection now
6218 is that I have heard people speak about it. At that time probably I hadn't called to mind what I have since been

thinking of. Now, that is all there is to that. Well, I don't know but that is true—that I said in conversation with them that I didn't recollect, but since that I have thought to myself that there were some people that talked about it, that is all. Yes, sir, I did tell that to Mr. Gregg this morning. That is what I said in conversation.

As to the value of lands in my locality now compared with what they were in the earlier days, of course they are higher. I got mine for $1.25 an acre. As to the productiveness of the lands in my county over an average of the last six or eight years compared with their productiveness in the earlier days, making allowance for the natural deterioration on account of long continued farm-
6219 ing (objection), I would say I don't believe we have been raising quite as good crops as we did. I couldn't say as to the cause of that. As to who those parties were that I have heard speak of the lowering of the water level, I can't say who they were, but I have remembered of meeting a group down here in town and talking about it. Down here in Wichita. Yes, sir, they were talking about it.
Well, I wouldn't say whether Mr. Rutledge was one of them or
6220 not. It is possible he was one of them. Yes, sir, he was active in this matter. That is what I had reference to when I made the statement that I did. It happened to come to my mind that we were talking about it. That was on the street. I don't know whether they just had a meeting in regard to that matter or not. No, sir, Mr. Murdock was not one of them. There were several farmers talking around on the street in regard to it. The possibility is that it was about the time they were having their meeting. I think that was probably ten or twelve years ago. I don't remember just when it was. Well, it may not be that long. I don't remember just how long it was—six or seven or eight or nine years. I don't remember.

6221 No, sir, I never heard any of the farmers up in my county on their farms at home away from town saying anything about their lands being injured in that way, and that is what I had reference to when I was talking with Mr. Gregg. I want that understood. No, sir, I haven't talked in reference to this case within the last year with people, outside of the talk I had this morning with counsel or the gentleman you sent to me. Never a word.

Cross-examination.

By Mr. ASHBAUGH:

My land is on the south or southwest side of the river.

As to my speaking on direct examination about the fact that if the river had been dry for a long time it affected the general conditions, I would answer, that has been my observation. To explain that a little, I will say, well, we have always been of the opinion that if the river was dry it was drier all around on account of the river having been dry. As to whether the long periods of time when the river has been dry have increased in later years, I couldn't

say. It was quite dry a good while in the early days some
6222 years and some years of late it has been quite dry a long time. Yes, sir, from about 1890 up to about 1896 there were several very dry years. I couldn't say what years they were because I never paid enough attention to it to know. As to my ever having known in the '70's an equal length of time when the river was dry to what I have known it to be dry during the '90's, I will say it was dry in 1870, 1872 and 1874. That I remember distinctly, because 1874 was the grasshopper year, and we remember that, all of us, and in 1872 I had a contract to put up hay along the river and we had to dig holes in the sand to water our stock. That I remember distinctly. I don't know how long the dry periods lasted in the early years or in the later years.

As to whether the condition of low water in the river affects the moisture beneath my land, I would say well, I suppose the water was farther down in the soil. It would be farther away from
6223 vegetation. I am satisfied that was a fact. Then if the river should come up and stay up for some time the water would rise under my land, certainly. There is no question about that. And that is what we call the underflow, yes, sir. As to whether the presence of the underflow affects the productiveness of my land (objection), I will say as a matter of course I always thought that the corn roots got down to the moisture when the river was high and when it was low they didn't. Yes, sir, that was my experience; and I have cropped that place from 1870 to 1900, yes, sir. Yes, sir, I stated that it was four or five feet to water on my place sometimes, and it would be nearer than that, of course, when
6224 the river was out of its banks. It was out last year all over us, but last year was an extreme year, yes, sir. I couldn't say how the underflow was during the '90's as to any particular year. As to it being a fact that the underflow depends on the amount of water in the river and not to any appreciable extent upon the rainfall (objection), I would say yes, sir. As to what extent an ordinary rain—not an extreme one—has upon the underflow, I would say, none at all.

The height of the underflow certainly depends upon the amount of water in the river. As to what effect the presence of the
6225 underflow has near the surface of my soil upon the productiveness of the land, I would say it is beneficial, no doubt. When the underflow during the dry season of the year is kept near the surface by a flow of water in the river, as to whether my land is more productive than when the underflow is low because of low water in the river, I would answer, yes, sir. I think that condition existed all the years that I have owned and occupied that land. I should think if it has existed at one time it would at another. As to how far back the underflow goes, I don't know. I never examined it farther back than my own place, and that is a little over half a mile. As to whether it extends back that far or not, I will answer, yes, sir, it extends back that far. Yes, sir, it is as perceptible,

I think, at the farthest part of my land, for all practical purposes, as it is near the river. When the river is full the land beneath is full of water. The whole of my land underneath is full of water. And when the river is low that dries up. I have dug post holes around on different parts of the place where we could strike water anywhere. And when the river is low in this same place we
6226 find dry sand. As to whether that underflow was near enough to the surface to effect a crop of corn during a dry year when rainfall was scanty (objection), I will say I think it would. Yes, sir, during a dry season of the year I have seen my corn affected by this sub-irrigation or moisture beneath the soil.

Yes, sir, I have heard parties here in Wichita discussing this matter. That is what I had reference to when I spoke. Yes, sir, they were some farmers living up around our neighborhood. I don't know whether they had those ideas before they came to town
6227 or not. (Objection.) I can't recall the year or anything about when that was, but it came to my mind this morning after I had been speaking to those attorneys that I heard these men talking about it, but I can't tell when it was nor how many years ago. It seems to me that I have heard or read about meetings held here in Wichita to discuss that subject, but I never paid any attention to it, really. I never attended any of those meetings. I am down this way from Mr. Rutledge's place, eight or nine miles. Land values are higher than they used to be, certainly. Improvements are better, better railroad facilities all over the country, and the country has developed greatly lately. Certainly it has.

Cross-examination.

By Mr. CAMPBELL:

6228 Yes, sir, I said I may have heard of a meeting here in Wichita of farmers in respect to the waters of the Arkansas river. I am not positive about that. At that time I owned land on the river. If I did hear of it at that time I never paid any attention to it at all.

Redirect examination.

By Mr. DAWSON:

No, sir, I never paid enough attention to the discussion of this matter or any meetings called to ever taken the trouble to
6229 attend. (Objection.) I never attended any meetings at which the underflow or the flow of the river was duscussed in open meeting.

No, I never had any reason to believe that my land was being so injured by the actions of anybody as to lead me to take any interest in the prosecution of any suit for the purpose of stopping what was being done. (Objection.)

In regard to the underflow extending across all of my land and

the farthest point that feels the effect as well as the nearest point to the river, and as to whether the underflow is more perceptible near the river than farther back, I would say (objection), I have never noticed any difference. As to whether this underflow goes on indefinitely back from the river, that I couldn't say, because I
6230 have no means of knowing except on my own place. As to how long it took my land farthest from the river to show any effect of the river being high or low, I would say it wouldn't take very long when the river gets bank full for it to seep through half a mile. I couldn't say just how long. I never timed it and don't know anything about it. I wouldn't think but a few days. That would be my judgment. I will say two or three days. Yes, sir, that would show half a mile. That is my judgment. But that is only a guess with me. I don't know. As to counsel asking me as to what effect a slight rainfall had on the underflow, I will say I don't understand counsel asked me that question. I understood that he asked me if a slight rainfall had any effect on the river. I understood it was the rise of the water in the river. That is the way I understood that when I answered that question. As
6231 to whether the rainfall has any effect on the level of the ground water or underflow, I would say, I don't know. I have no way of knowing as a matter of fact whether that water which is called the underflow all comes from the river or whether part of it is the natural drainage of the country which has absorbed the rains that have fallen upon the country. I have no way of knowing about that. Yes, sir, I simply know that there is water under my land and that when the river is high it is a little nearer the surface and when it is low it is a little farther from it. (Objection.)

Recross-examination.

By Mr. ASHBAUGH:

6232 As to any statements I made this morning to counsel for the State of Colorado concerning the underflow, prior to my being sworn here, different from what I have testified to, I will answer, I think not. At least if I did it was something that I really didn't pay any attention to what I said. I have said now what I believe to be true, regardless of what the gentleman may say in regard to it. I want him to understand that.

6233 W. G. MALONE, Wichita, Kansas.

Direct examination.

By Mr. DAWSON:

I live seven and a half miles northwest of Wichita and nearly half a mile from the Arkansas river. My land abuts on the river, and I have lived there off and on for twenty-seven years, since 1878.

The longest time I have ever been gone from there was about eighteen months, which was in 1885 and 1886. I might state here that I am a renter on the farm. I don't own this farm I am occupying. I rent of Mr. Madison Aley. I have been engaged
6234 in farming all my life, and am forty-one years of age.

From the place where I am farming I can see the water in the Arkansas river. I can see the place where it is, only at certain seasons. I can see the water at the present time. But in going around on my farm and attending to the work I am in position to see it at different times, and that has been true nearly all of the years since 1878. This land is on what we call first bottom.

Taking the river over a period of say ten years last past and comparing the average flow of it for the ten years with the average flow for any earlier period, I will say I never thought there was any material change in it. (Objection.) In my judgment I think it is about the same river in character and flow that it has always been since I knew it. (Objection.) I have no reason to think it should not be.

6235 On this land we go different depths for water, owing to the elevation of the ground one digs on. Of course the closest I expect I could get water is in two feet, and the deepest, on a knoll, I could hardly tell how deep I would have to go. As to any change in the general level of the ground water underneath the place I am farming since I have lived there, taking the same kind of a season, for rainfall, I would say that I have no means of knowing, with the exception of—I am on a very low farm and at all times the crawfish work up holes through the surface and you can drop a little clod down in a crawfish hole and you can hear the water chink and splash. Of course I have no way of knowing whether it is lower than it was then or not, but you can get the same sound in
6236 about the same space of time. As to whether from any of my observations I have had any occasion to believe that there has been any material or permanent change in the water level under this farm since I have been there, I will say if there has been I have never noticed it.

In regard to the productiveness of this land now as compared with earlier times, I would say I don't think it raises as good crops now as it did formerly, but you take a piece of new ground and you will have as good success with crops as we did in the former years. I think the deterioration in the soil has a good deal to do with the fact that we don't raise as good crops now as formerly, and that deterioration is caused by the constant taking off of the land and not putting anything back.

6237 Yes, I came here in 1878 but have never owned any land myself. I was away about eighteen months at one time in 1885 and 1886. I have rented the same farm that I now live on since 1890. This place is seven and a half miles northwest of Wichita, and the river adjoins the farm. Part of it is wet and part of it is dry. I mean by wet land, land that holds water, where the

water don't drain off of it rapidly. Yes, there is an old slough there. It runs down through that place. It is a depression. It has no well-defined banks or anything. There is about two feet of water in that slough now in one place, on this 9th day of May, 1905.

6238 That slough is of various widths, probably a rod or two wide, that is, where it is continuously water, and I think the whole length of that slough where the water is now is the whole length of one of the quarter sections. Where it is two or three rods wide is the widest place. I expect it will average a rod wide where the water is, and clear across the place I am on. Part of the land is sandy. That slough last year was full of water—not the whole of the year 1904. It had water in it in 1904, I should say, from the 10th day of May until the 15th day of July, and at times in the fall after a rise in the river or a heavy rain. I don't know as I would be able to tell which affects the slough most—a heavy rain or

6239 a rise in the river. They both affect it. I don't remember as to there being two or three rises in the river in the fall of 1904, but this slough had water in it two or three times in that fall.

Yes, I think I remember something about the Eden wreck up in Colorado, but I don't remember the particulars.

The way the river affects this slough, if it is a sudden rise and goes right down again it doesn't affect this slough, but if it stays up any considerable time it will seep out into this slough.

There might have been a heavy rain up in Colorado or New Mexico that caused the washing out of the Santa Fe railroad tracks. It seems to me like I remember something about it.

6240 Yes, sir, the land along this slough and for some distance back was pretty wet last year, so that we didn't farm it at all. It is too uncertain. That slough always has water in it every spring. It is generally dry in the fall. I think it was dry in the fall of 1903. As to how it has been during the last ten years prior to 1903, excepting in flood times of the river, I will say it is just as I tell you, a rise in the river will throw water in there, or a

6241 heavy rain, either one of them, and I might say there is a ditch cut off of the farm land that runs water in there too. No, there was no water in that slough during times when there is no flood in the river, unless there has been a heavy rain. No, sir, an ordinary rain does not affect that slough very much. A big, heavy rain does, yes, sir. Such a rain as caused the flood at Wichita in 1904 would affect it. On the balance of that land we raise wheat, corn, oats and potatoes. I don't think that the condition of the river affects the land on the west quarter to any extent at all. I never have any trouble farming the land unless it is flood rains.

Yes, sir, I have heard of the underflow. As to whether that affects the balance of the land outside of this slough, I don't

6242 know. I am not able to judge whether it would or not. I know the water stays on quite a while when the river is up. Generally, the river is up when we have these flood rains. When

the river is down, as to whether the water level under the balance of the land is lower than when the river is up, I don't know. I never examined it and never paid any attention to it. As to whether the land is more productive when the water level is up during a dry season than it is when it is down, I don't think it makes any particular difference. If there is not sufficient rain to mature the crops we don't have any crop. Part of this land
6243 is sandy and part of it is heavy, black loam. I know one time the river was full and the hot winds were blowing and it burned the crop up all the same, and if there was any underflow it would certainly be rising up at that time. I can't tell the year. I should say about seven years ago. We can't see the river from my place only in times of high water. You can see the water in the river at such times. I can't see any particular difference as to the width of the river. Yes, there are islands in the old channel of the river. There were islands there thirty years ago, just as large east and west as they are now. No, not just as large north and south. There seems to be a little bar formed on the ends of them, that is, one in particular. I live right across the river from it. I don't know what causes that to form. Yes, these islands are grown over with young cottonwoods of different ages. I would
6244 say there are cottonwoods from little ones that just come up to cottonwoods four or five years old. There are none ten years old on any of this made land that I know of. By this made land I mean land that has been formed at the ends of these islands. There is no made land on my side of the river. There is on the other side. I am on the west side of the river. I couldn't say how far along the river on the east side there is made land. There is no made land on the west side of the river that I know of. The made land on the east side of the river is as wide as those old islands. It tapers to a point. I don't know
6245 whether the islands are connected with the bank or not. I can't recall any of those islands that used to be disconnected that are now connected with the bank. Yes, sir, it would benefit the land I have if the river were lower. No, sir, I didn't come down here for that purpose. Well, I don't know whether that is the reason I came—because this particular piece of land would be benefitted by less water in the river. That was only a surmise. I haven't any interest in this case particularly at all. (Objection.) We don't farm that land along the slough; we cut hay on it. I don't know how much of that land that I have been renting is good, tillable land. I couldn't say. Some of it would be a good deal more tillable if it were drained than it is now.
6246 No, sir, I don't think we raise as good crops now as we used to. That piece of land is the only one I am speaking of. Yes, sir, the only way I have of testing how deep the water is underneath this land is by the holes of the crawfish.

Redirect examination.

By Mr. DAWSON:

I am not here by subpœna, no, sir. One of the Colorado attorneys came to my place yesterday and he told me to come down here today. He didn't tell me whether he had a subpœna for me or not. He just told me to come, and I came. I was just
6247 called upon and questioned about what I knew in regard to the river. That is all I know about it. I know Mr. Rutledge here slightly, that is all. I am sure I couldn't say whether he has taken any interest on the side of Kansas in this matter or not. I have heard that he had, but so far as I am concerned I don't know who is interested on one side or the other, any more than I have been able to learn right here before the commissioner. No, sir, I have no interest of any kind in the outcome of this suit.

6248 J. R. BROWN, Wichita, Kansas.

Direct examination.

By Mr. DAWSON:

I live at Colwich, in Sedgwick county, Kansas. That place is about five miles from the river. But I settled on the Arkansas river in 1870, in the month of March, at a place about five miles due north of Colwich, and I lived on that farm from that time until 1887, and was engaged in farming, and then I came here to Wichita and was here four years, and then I moved back to Colwich and have lived there since.

6249 I have, yes, sir, more or less, been acquainted with the Arkansas river since 1870. As to the average flow of the river over a period of say ten years last past, compared with the average flow for a like period of time when I knew it first, I would say I have seen no difference in the last ten years. It has had its ups and down, its drys and its floods the same as it did in the '70's. This has always been a river of extremes since I first knew it. It has been dry, it has been bank full and out of its banks. The river bed changes some through Sedgwick county with reference to its channel, shifting from place to place. At one time it is deepest on one side and at another time it is deepest on the other side. That has been my experience. Yes, it does sometimes cut away the bank on one side and build up on the other. I have known it to cut out the stone quarter section mark that stood say a rod out and
6250 finally worked that away and took it away. All of my land was on first bottom. There were sand ridges that ran diagonally across it. There was some heavy, black soil—low land. It varies in that way. Yes, sir, my farm abutted on the river. Well, just wait a second. My old quarter section that I homesteaded didn't, but I bought fractions later that did take it up to the river.

At one time I had diagonally across section 28, across the whole section, and all on the south side of the river—all of section 28, 25–2 west. I had about 110 acres under cultivation. The grass land we didn't consider under cultivation, nor the pasture lands. I had at one time all together in pasture, grass land and farming land, about
500 acres. But I have now sold that all entirely.

6251 As to the general water level of the country along the valley of the Arkansas river in the neighborhood of where my farm was located, and where I now live, as compared with the general water level of the ground water in the earlier years, I would say I haven't noticed any change. In Colwich there where we lived we bore with an auger to the sand, then we have to stop. Wherever we strike that sand we strike water and we can't bore any farther, and then we drive from that down. On the river bottom I have put in several wells there, drive wells, and we then drive a hole down to the sand and sledge the pipe down as deep as we want it. I never saw any difference.

As to the crops raised in that general section about Colwich now as compared with those raised say in the '70's, '80's or '90's, taking the three periods, over say ten-year periods, taking it on that light, sandy soil, we don't raise as good a crop as we did in the '70's. Take it on the heavy, black soil,—take the farm exactly south of me, owned by D. E. Breese, I think he raises just as good a crop now as
he did then on the sandy soils. But that sandy soil has

6252 deteriorated. It has worn out. It is certainly true that the sandy soil wears out in three or four years. But aside from the natural deterioration of soils by farming, I think there is nothing further than just the deterioration—the wear—of the soil. I can't see any difference. On my place, my brother-in-law is on there now, he raises good crops in places and in certain years he raises good crops—of course not as good, as I said, on that sandy soil, as the first was. Virgin soil for two or three years raises the best crops. The sandy soil was the best we had at that time.

Yes, sir, I have had a pretty wide acquaintance there through that country up there with the lands and the people. (Objection.) As to the values of land in that section now compared with earlier times, I would say in earlier times we didn't consider our lands
worth much of anything. They have doubled and trebled.

6253 Lands have gone away up in the last few years. No, sir, there hasn't been any time since I have lived in that section that the average price of farm lands has been as high or higher than it has been for the last few years.

Cross-examination.

By Mr. ASHBAUGH:

Yes, sir, the land has all advanced in price, and there are better improvements, better markets, better facilities for marketing and everything of that kind is now better than in the '70's, surely. Yes,

sir, I have spoken of the river being up and sometimes being down.
I don't think I ever knew a spring when there was not high
6254 water at some time during the first six months of the year.
That is in May and June as a general thing. We then look for our floods. Yes, sir, in the early days we had our high water and we had our low water. I drove in the river bed for a mile or more with my team when there was no water in it. I think that was in 1872, in the spring, before the June rise came from Colorado. In the years 1875, 1876, 1877 and 1878 we generally had water in the river all the fall, is my experience. In 1887, 1888, 1889 and 1890 I was here in Wichita and crossed the bridge every day, and I lived on the west side. I always found water there. I don't think
we had any floods, but there was always water in the river.
6255 I lived in Wichita in 1891 and 1892. The last time I lived
on that land was in 1887. I couldn't tell you how the water was in the river along my land in 1890, 1891, 1892, 1893, 1894 and 1895. I wasn't there. I have been back and forth across our bridge there every year in the fall for the last twelve years, and I think there has always been running water in the river in the fall. I had a brother-in-law living on the other side of the river, and I went back and forth across the river. As to the river having gone dry at Colwich within the last twelve years, the river is quite a ways from Colwich. That river I don't think ever was dry but
what there were holes along the bank. During July and
6256 August for the last twelve years it has not gone dry at Col-
wich to my knowledge. I wouldn't wonder if the flow had stopped there at times, but I never remember seeing it when there was not running water. I have seen it from four to six times every year, I have crossed that river. I have seen it dry just about Wichita at the 16th Street bridge where the water wasn't running, within the last twelve years. It is liable to be drier here at the 16th Street bridge than it is at Colwich, yes, sir.

When I speak of continually flowing water I mean the water in
the bed of the river between the banks. The channel be-
6257 tween the banks through Sedgwick county in some places is
as wide as it used to be and in other places it is narrower, and in some places it may be wider. No, I don't know of any particular place where it is wider, but I do know of places where it is narrower. As to what caused it to narrow, a filling in and growing up of trees. I know where there were islands and a little channel running between the island and the shore that that island has filled in and has grown up to trees, and that island is now connected with the mainland, yes, sir, exactly. The main bank is still there. It is just filled in so that unless there is a rise of the river the water don't
flow over it. It would take quite a little flood to go over that
6258 now. I don't know whether there are more islands in the
river between Colwich and Wichita. I have never travelled along the river there. Yes, sir, I know what is known as Ackerman's island here. I couldn't tell whether it is larger than it used

to be. I think I remember seeing it in the early '70's. There was a ferry boat across the river then; I don't know where. I believe it was located where the Douglas Ave. bridge now is. I don't remember whether there was a bridge there then or not. I can't answer what kind of a bridge was built across the Arkansas river as the first bridge that I saw. (Objection.) I don't know
6259 what kind of a bridge is across there now. It is an awfully poor one. It is about worn out. No, I don't know what part of it is worn out.

Examining Complainant's Exhibit A–1, yes, sir, I have crossed that bridge. It don't look natural to me across the Arkansas river. It may be the old wooden bridge that was built in 1872 and taken down in 1879. I don't see any evidence of Ackerman's island
6260 in that picture. No, I don't recognize that as the wooden bridge across the Arkansas river.

Yes, the river has filled in up along the land that I used to own north of Colwich. There is an island out there and there was a little channel running between the land and the island. The little channel closed up and that little island has been taken into a cow pasture since and has growed up to timber. As to what caused the channel to fill up, it was the change of the channel of the
6261 river. The river went to the north side. The river up there is north and south in place of east and west. There is a turn in the river. Just a little way below that channel crosses over again and washes into the south bank. That filling in was caused by the change of the channel of the river, washing out more on
6262 the other side. It cut into the banks on the north side. It is washed out deeper on the north side, but just below this bar it cuts right across again and strikes the south bank of the river. There is something similar below that. It has made the land on the north side that has grown up to timber. These changes are taking place at all times. We never could tell just exactly how it was it would change so often, even in the bed of the river. These islands were covered or nearly so with large cottonwoods, and they cut them and made house logs of them and hauled them to their property and built houses out of them. No, sir, I don't know what is known as Swan's island. I couldn't tell whether there is as much water during the dry season of the year flowing in the river from 1890 to 1900 as from 1880 to 1890. I have no basis or observation to make such a comparison as that upon, and I have no basis on which to make a comparison as between 1870 to 1880 and 1890 to 1900, no, sir.

There is only a very small proportion of my land affected by these sand ridges. It angles across the course of the river out a ways from the river. Some of it up close to the river I never broke up at all. We thought it more valuable for mowing and grazing pur-
6263 poses. When the river was up the water was very often up on that land—on the grass—and when the river was down there was no water on the land unless from a rain.

Yes, sir, I know what the underflow is, but I don't hardly know how it affects my land. My judgment has always been that there hasn't been much change in the underflow. I have shallow wells. I have had windmills with only a twelve foot pipe on and never exhausted the water. I could not pump it dry. I will say there hasn't been any change. Yes, sir, the underflow rises and falls according to the condition of the river. Yes, sir, after the river has been up a time the underflow is higher, and after the river has been low for a time the underflow is lower. I couldn't say how far back
6264 from the river the underflow extends. My judgment is, just as I spoke some time ago about boring at Wichita for a well, we would strike that sand and we could get water. We would have to drive from there. I never experimented with it and don't know whether, after the river has been up for some days or weeks, we find the water level higher than after the river has been down for a number of weeks. Yes, sir, the underflow extends back through the land that I did have and would rise and fall with the river, but I don't know that it extends to any other land. Yes, sir, my observation has been confined to the land where I now live. As to whether we had good crops in certain years or not, it depended upon the rainfall. If we got hot winds it didn't matter if the wheat
6265 stood in the water, it would get our wheat. There were several years when we did have hot winds, but not always. Yes, I believe the closer to the water the roots of crops were the better the crops would be, if it were not for the hot winds.

Yes, I spoke about the channel of the river there at the island on the north side. It has washed the bank away and back farther into the soil on the north side. Yes, sir, it did. I couldn't say how far back. It kept washing under and caving in and caving in, and it did the same on the south bank, when it changed over to the north bank again. As to the net result of that washing back being equal
6266 to the amount that has filled in on the other side, no, not including the island. Taking the island in, no, not nearly.

Redirect examination.

By Mr. DAWSON:

Between the island and the mainland the river is from sixteen to twenty feet wide. I think the narrower the river is the deeper it is. When it ran at its full width in places it was generally very shallow, but when the current is in on one narrow channel, as a general thing you will find it deeper. I have had experience in crossing it with teams often; and my general experience as to the
6267 confining or narrowing of any stream of running water is that it would make it deeper, naturally. As to the effect of that upon the carrying capacity of the river, I would say, well, I don't know. The river there overflowed along in the '70's, and it overflows now at times. Whenever the river gets up it will come out of its banks. The banks are too low. Yes, sir, that is

what I meant when I spoke of the water being on my land when the river was high. It comes over the bank in places.

As to my stating to counsel that I had no method of determining the flow as compared between ten years in the '70's and ten years in the '80's and ten years in the '90's, I will say, why, I can't see that there has been any change. (Objection.)

6268 Yes, sir, I spoke about an island having been attached to the mainland, and I have known of residents along the streams aiding nature by artificial means in the attaching of islands to their land. Well, as to knowing of some one instance, I would say I know of one case in particular. That is all I know anything about. The result of that effort, by putting in sticks across the little channel, like that one north of my place, and weaving in some brush, is that it will naturally close up. Yes, sir, I know of that being done in one instance, and after that was done the island became part of the mainland.

Recross-examination.

By Mr. ASHBAUGH:

No, sir, I didn't do anything to induce these channels to close up at my place. This was not at my place. At my place it was a natural closing, yes, sir, and the other places that I mentioned, with the exception of that one, were the same. As to whether if

6269 there had been a big flow of water in the river for the last three years continuously it would have washed out in spite of what had been done, I will say, a good, big flow of water will go over it anyway. It does now. When this island is overflowed it leaves more sediment in there. Every time it overflows it seems to raise it up. I have known three or four inches—it has been the understanding that anything abutting onto our property along the river, if it connected with it, was ours. It has always been so. (Objection.)

Cross-examination.

By Mr. CAMPBELL:

It is fourteen miles from Wichita to Colwich by rail. There are no streams running into the Arkansas river on either side between Wichita and Colwich. Colwich is about five miles from the

6270 river.

I have been mayor of the town of Colwich, and register of deeds for four years for Sedgwick county, for two terms, from 1888 to 1890 and from 1890 to 1902. I lived in Wichita those four years, and then I returned to my farm.

6271 HENRY LOSHBOUGH, Wichita, Kansas.

Direct examination.

By Mr. DAWSON:

I live in Sedgwick county, Eagle township. That is twenty-three miles from the city of Wichita. My farm is right on the Arkansas river. The river makes the line and my land extends along it about three-quarters of a mile.

I am forty-seven years of age and have been in Sedgwick county, I guess, about thirty-two years. I came here in 1872. That would be thirty-three years this July. And I have been engaged in farming all of that time. Yes, sir, I have known the Arkansas river since 1872. I have lived right along it ever since I have been in the State, and I have lived not exactly in that locality, but in Sedgwick county. I lived down here at Maize, a little closer to
6272 Wichita, at one time. During all this time I have lived where I had an opportunity to see the river. I bought the place where I now live in 1891, and have lived there thirteen years. No, sir, that was not the first time when I went up in that particular locality. I have been up and down the river for years. Ever since I have lived in the State I have been up and down the Arkansas river.

I have a deed now that calls for 131 acres, more or less. I have got probably 175 or 180 acres, I suppose.

Yes, sir, in the early days I was interested in the stock business, and while interested in that business I had occasion to go up and down the river. Why, I have seen the Arkansas river practically dry several times in the '70's and '80's, and even up to the '90's I have seen it dry in different times. I don't know that I could state the exact years, but I have seen it so dry that I could and did drive cattle right in the bed of the river.

6273 As to taking a period of say ten years last past and comparing it with any other ten year period before in regard to the average amount of the flow of the river, I would say in the last eight or ten years there has been as large a flow of water as there ever was.

My land is first bottom, right on the river, and I go from four to five feet for water, and in some places maybe six or seven. It differs a little on the rises according to the land. As to my observation in regard to any permanent change in the level of the ground water or underflow, I would say I don't know what you would really call the underflow of water; but in regard to the level of the first water that I strike, I would say I don't see much change in it unless there would be a real rise in the river. Of course that would raise it up some. Of course this last rise the water really came up to the top of the ground. When the river is dry it would probably be a little lower. Yes, sir, in those places where it comes to the top of the

ground, they are low places and near the river, and such places as that when the river is up show some water and when it is low that subsides or goes down, yes, sir.

As to taking one year with another over a period of a whole year and four or five years, as to whether there is any difference in the level of the water underneath the ground in my locality in later years as compared with earlier years, I would say no, sir, I don't think there is, for the simple reason—it is this: I have got a
6274 well—to explain that thoroughly. It is about twelve to thirteen feet, and I have never seen it here that it could be exhausted. The pump can run night and day, and you couldn't exhaust it at any time. The driest time it could be run night and day and it would be impossible to exhaust it. I know that. And back a few years ago we had an awfully dry year. I think that would be a pretty good test of it.

As to the effect of constant farming on the productiveness of the land, I would say, well, taking crops off the land, I think any person would think that successive crops taken off the land would weaken the land. We know it does; we don't guess at that. Yes, sir, that has been our observation and experience.

6275 Allowing for the natural deterioration of the land, as to its productiveness now compared with earlier years, I would say my land, by fertilizing it, and keeping it up, I don't think it is as productive as it was when I first broke it, when the sod on the land was new, but by keeping it up I think it holds along fairly well. But so far as the climate or weather conditions are concerned, either rainfall or ground water, as to whether the land has become any less productive in the late years than in the earlier years, I would say I think it has; that is, I think when the land is newer it produces bigger crops. But if I make allowance for that deterioration, as to whether there is any change in the productiveness of the land because of any change in weather conditions, I will say
6276 no, sir, I don't think there has been.

As to the values of land in my locality now compared with what they have been in the earlier periods, I would say there is quite a difference since I bought that land. When I bought it I gave about $15 per acre for it. I suppose I could sell it now for from $45 to $50 an acre. Land is selling now all the way from $45 to $60 an acre.

Cross-examination.

By Mr. ASHBAUGH:

My deed calls for 131 acres of land up there, more or less, and I have got just the same, a little less, I guess, if anything. No, I haven't got any more than I had then. When I mentioned 175 acres in my direct testimony I meant I bought it when there was made land there, and there is now. I bought lots numbered 7, 8 and

9, and these lots lie next to the river. Yes, sir, there is
6277 made land along it, and I have more land now than I had before, yes, sir, more than when the Government survey was made. I am right in the bend there. I would judge there was probably thirty acres more. That has been made, I suppose, from the river and timber and such things. It was made by the river and the sand from the river, of course. The land was made there by the filling of the river, and these trees grew over it, that is, over a part of it. No, sir, I didn't do anything to increase that made land. It is a natural accretion by the conditions of the river, by its growing deeper and throwing out. My first notice of that beginning along in the stream there was along
6278 early in the '80's, and I know just above Maize there was a piece of land made in there and cottonwoods started right where we forded the river. Yes, there has been some made land just above where the bend of the river is, and there has been some made land just below in both places. I want to make you understand, when it turns off to the south it comes in there and throws off to make this land. It is cut off on the other side and
6279 thrown out on this. No, sir, the river banks are not as wide as they were when I knew them first; they are considerably narrower. Yes, sir, there are islands up there now that were not there when I first knew it. I couldn't say that they are growing larger at the present time. Yes, sir, I believe they have grown larger within the last fifteen years in some places and covered over with cottonwood trees. As to how old those cottonwood trees
6280 are, some of them, I would judge, are now from twelve to eighteen inches in diameter. That is about twenty-three miles above Wichita. Yes, sir, it is true that there are more islands in the river between Witchita and my place than there were thirty years ago. Some of them might be larger, but all of the islands I have noticed in the last ten or twelve years have not increased much, that is, so far as I can see. They have grown over with trees, yes, sir. I wouldn't want to say as to when that growing over with trees practically began; that commenced somewhere from twelve to eighteen years ago that it was noticeable—most noticeable. I have noticed some of them before that, but to notice them starting and the timber growing on the islands in the river bed, it was some-
6281 where along there, as near as I can tell. My land is what is called a sandy loam; that is, right on the river. Yes, sir, it overflows, I think in the last twelve or thirteen years it has overflowed about four times. I think it overflowed once in August in the '90's and once in May in the '90's, and it is overflowed now (May 9, 1905), and it was overflowed last year. I guess it has overflowed five times. I don't think it overflowed more than once last year. No, there is no slough on my land. The land is not too wet for general cultivation unless it overflows. I cultivate corn down next to the river. I have raised a good crop of corn during the last twelve years pretty nearly always, unless it overflows. The diffi-

culty is, my crop drowns out when it overflows. My land extends back from the river at the farthest point about half a mile.

6282 Yes, the water level under my land is different at different times in the year. Of course it is. As to why that is, it is for the same reason that the river is out of its banks—has been the last few days. Last week it was out of its banks. Then the river was close to the top of the ground, of course. Some of it was on top of the ground, because it ran over. On the part of my land that don't overflow I put my well down about twelve feet. I guess it is not over six or seven feet to water at any time of year that I ever dug. I think there is about six feet of water in my well. It is a pipe well point. No, it is not an open well—a drive well. You can't see the water in it at all unless you take the cylinder cap off. Then you can't see the water in the pipe.

6283 The pipe is an inch and a quarter pipe, I think. No, I don't judge of the condition of the water level because I can't pump that well dry. I don't judge from that, because I have dug to this cylinder in the water. We always have to take those cylinders up more or less. When I set that in it was set in the water; that is, to the bottom of the cylinder. I should say that the lowest that I ever knew the water level to be was about seven feet below the surface, and at the highest point it would be within two and a half feet of the top—maybe within two feet. As to what caused this variation, I would say it would be the rise of the river, the same as it is now, or heavy rains like it was last year. Either will do it. Yes, when there has been no rain to affect it the rise and fall of the river does to a certain extent affect the water level in the well. As to how far back that extends, I don't know exactly. I can say this—when the river is up it will affect my well in about twelve hours,

6284 and that is just about 80 rods back from the river. Yes, if the river had been dry and a sudden flow should come, I would probably notice it in my well in about twelve hours. Yes, sir, if the river stays up three weeks it would practically raise the level of the water in this sandy land in places. As to what effect on the water level under my land there is if the river would be dry for a number of weeks, I will say it is but very little. It don't average over two or three feet. That would be my honest opinion in regard to that level. As to the water level under my land after the river gets dry, I will say it is bound to go down after the flood decreases. As I say, the rise of the river coming up, in twelve hours it will go back to that well. If the river goes down the water will fall with it. Yes, when the river is up it comes within about two

6285 feet of the surface of that well, something like that, and then when the river is down the level of the water in the well is about seven feet, as near as I can tell. Yes, sir, the variation of the level of the underflow at that well is about three to four feet. You see seven to two would be about five feet, yes, sir. As to whether it affects other wells out there in the same way, I would say all, I

think, that are along next to the river are the same as mine. They are all affected alike.

Now, during a year when it is dry from lack of rain, and when the river is up, as to whether my land was more productive than though the river had been down during such a year as that, I will answer, the driest season ever I saw here, on 85 acres I raised 1,200 bushels of corn. I don't know that the trouble with my land is that it is too wet. The majority of it along the river you will find from my place below runs about the same—that is, three or four miles below. I don't think there is but very little difference on the
6286 farms lying next to the river. When I raised that good crop of corn during the year when there was a scanty rainfall, that was that dry season. I don't know that I can state when it was. It was three or four years ago, something like that. As to where the corn got its moisture that year, I would say, out of the ground, I suppose. It don't seem as though there was rain enough to raise a corn crop that year. If the underflow had been low that year, as to whether I could have raised as good a corn crop as I did, I will say, why, I don't see why I should not. As to the underflow having anything to do with my corn, I will say, not a bit of it. I think the underflow has done more harm than the underflow has done me good. The simple reason is that my farm is against the river. Yes, that is what caused the underflow.

Yes, I am familiar with other wells in that county and the condition of the river affects all that are along close to the river like mine. I think it does, As to how far back I have known
6287 wells to be affected by the raise and fall of the water in the river, I would say, well, about a mile or a mile and a half, something like that, out to the slough. That averages from a mile and a half, possibly, to two miles. Yes, sir, I have known that land out there to overflow back a mile. It did this time. It wouldn't overflow beyond the mile because it would have to go over the bluff. I was farming along the Arkansas river in the '70's, at different places, about a mile from the river, as near as I can re-
6288 member.

Yes, sir, the river was dry during the '90's. I think it was dry in 1890 or 1891. I have known it to be dry at different times back about 1894 anyway. Since that time I have not known it to be dry. As to whether it was dry in 1895, I wouldn't want to say, but I don't think it was. I know it came up there one time after it was dry, and I have not known it to be dry without being running since. I don't think it was dry from 1896 to 1903. Yes, sir, I mean to say that the river was not dry near Colwich in the fall of 1903, at any time in the fall. Nor was it dry in 1902, nor in 1901, nor in 1900. I recollect this because I am right there on the river and I go for the cattle and my pasture is right there and I can see the river from it, and I know it has been dry since 1890. I
6289 don't remember as far back as 1879. It was dry in the '70's, and in the '80's a little but I don't want to state the years it

was dry. I can't remember. But it was not dry in the '90's. Now, in 1901 and 1902 it was dry once that I know of. After I bought the farm it was dry once. In 1896 I don't think it was dry. It never has been dry but once since I have owned the farm, that is, practically dry, and that was in the early part of the '90's. Yes, sir, my land has been too wet to cultivate down next to the river within the last twelve years. I think I have lost three or four successive crops; that is, when I say lost them, the majority of my crops, and the reason I lost them was that the river overflowed—too much water. No, it didn't overflow in the '90's as bad as it did in
6290 the year 1904. There was one time I think the river was as high as it was in 1904. It came out in August, and that was in the '90's, but I will not state the exact year. It ran over its banks. It probably was not as high then. There are lots of us neighbors differ in regard to that, about its being as high. Yes, sir, I have seen it dry in the '80's, I wouldn't state the exact year. I have seen it dry a number of times. Yes, sir, I think it has been dry oftener in the '80's than it was in the '90's.

Redirect examination.

By Mr. DAWSON:

As to whether any of the islands I have spoken of as having been in the river ever since I knew it had trees on them in the early days, and whether any of those trees were ever cut off and then the island grew up again, I would say, well, those islands in the earlier days formed there, of course, and then the seeds scattered there and the trees and willows came up, and that is what formed the
6291 islands, as near as I can tell. No, there were not any trees on the islands when I first saw the river, not until you get—there was an island just above Wichita that had, and there was an island just below where I lived that had some heavy timber on it. As to how long ago the country through here was planted to trees pretty generally—that is, that the farmers put out trees,—you take it along in the '70's, the people began to plant cottonwood trees here, and it took probably seven or eight years, maybe ten, before those trees got to be of sufficient size so that the seed from them began to scatter over the country—six or eight years anyway. I wouldn't want to say positively. But the trees, generally speaking, throughout this country, had gotten up large enough to furnish seed that could be scattered over the country by the winds about twenty-five years ago. That is as near as I could guess at it—that they were planted or had grown to be that size, yes, sir. Mostly, they were planted at
6292 that time. Of course there was some timber on them. It would be six or seven years, something like that, after the trees were planted, before they would be big enough to furnish seed.

When my land overflows on account of the river being high in flood times, I should guess the overflow covered within twenty-five

or thirty rods of this well I mentioned, as near as I can tell. Yes, sir, there is a slough or depression back next to the bluffs down back of the country where I live. There is a slough just a mile south of me, about a mile and a half south of me, I guess, as near as I can tell. No, I don't think that slough connects with the river at either end. It empties into the Cowskin down here at Hayes,
and it has its headwaters in south of Mount Hope. I should
6293 say at Mount Hope it is about four miles from the river, and it keeps along from about three to four miles from the river, I should judge, on an average. In some places it is closer than that. Yes, sir, when there are hard rains in the country that slough overflows, and when the river is high it overflows and goes over into the slough. Yes, sir, this land that is occupied by myself and others along the river there lies between the slough and the river. Yes, sir, when the river is high enough to overflow my land at some point up along the slough toward its headwaters the water comes out of the river into the slough. When the river is high it wouldn't lack but a very little of getting into the slough in the spring. Yes, sir, when the river and the slough are both high the ground between the two is apt to be pretty wet. I guess so. The horses mire in it.

Recross-examination.

By Mr. ASHBAUGH:

6294 I generally come to Wichita by rail. I sometimes drive, though, and when I drive I generally keep along down the river, that is, unless the roads are bad and it is wet, then I take the uplands. Yes, I have crossed the Douglas Ave. bridge off and on at different times for the last twenty-five years. Yes, sir, I know what they call Ackerman's island. The first time I ever saw that island was when I came here first. That was the beginning of it, yes, sir. There was a small island there in 1872, just above the bridge.

Examining Complainant's Exhibit A–2, I will say that dark spot
is the island there. That is what I think. No, there were
6295 no trees on it then. The trees began to grow on Ackerman's island in the latter part of the '80's, as near as I can remember. Yes, sir, I think that island is larger now than it was then, because it is made bigger. I know it is. It is quite a large island now and is grown over with trees. Yes, sir, you can notice those trees now as you cross the Douglas Ave. bridge, on the upper end of it. They have been cut off on the lower end. I think they were cut down last year. I should judge some of these trees are six or
eight or ten inches in diameter, yes, sir.

6296 Examining Complainant's Exhibit A–3, I will say I think the point of the island was a little above the bridge. I don't believe it extended down under the bridge. I can't say how wide

the river was here at Wichita, but I know they took out three or four spans of the bridge.

Examining Complainant's Exhibit A–1, I will say I recognize it. It looks to me like a better picture than when I saw it first. That is the best picture I have ever got of it yet, that is, of the Arkansas river. Those trees all look very natural to me on the west
6297 side. This looks all right also on the east side. I don't believe that is the same bridge as shown in Exhibit A–3. That in Exhibit A–1 looks to me like the old toll bridge. It looks very natural to me. I know there has been about three spans of the bridge taken out, and I know the river is narrower here than it was then. We forded it right here in 1872. Yes, there was water then from bank to bank and the bridge was built when we forded it. No, the ferry wasn't running then. We forded the river when there was a bridge there because we were like hundreds of other people, I suppose,—too poor to pay the toll. As to whether there were times when we couldn't ford the river, I would say not in the '70's. I wouldn't say it was not, but we forded it in 1870 whenever we hit it. The banks were low and shallow and we would all ford it because we had no bridge to cross until we came to Wichita. When I forded the river in 1872 it was from bank to bank, and I waded
6298 it most of the way. As to how wide the river was, it was along under my arms here in places, unless there would be holes where the sand would come up. Yes, it would average something like four or five feet deep. I don't know, I was fifteen or sixteen years old. That was on the 4th of July, 1872. As to how high the water was when Exhibit A–1 was taken, as to whether it was high or low water, well, I wouldn't say it was high water. The water in Exhibit A–1 would be just about as the water looked the first time I saw it, as near as I could tell you, when I crossed it, and I would say it was three or four feet deep. That water would be, as shown in Exhibit A–1, I should say probably eight or ten feet down from the bridge. Yes, sir, I was here in Wichita at the time the big flood was here in 1877, and I surely did see the water at the bridge
6299 during that flood, and that is the bridge that is shown in Exhibit A–1. The water came very near the bridge, and I wouldn't say it didn't go over the floor, but it came right up to the sills; that is, it touched the cross pieces right at the bottom where they set on the piles. I believe that any floating material, like a tree or a board, would almost have struck the sills of the bridge. That is my memory. I crossed it, and it pretty nearly swam our horses when we got to the other side, in west Wichita. I should say that the flood water at the highest point that I saw it would be probably six or seven feet higher than the water as shown in Exhibit A–1.

6301 S. M. TUCKER, Wichita, Kansas.

Direct examination.

By Mr. GREGG:

I am seventy-four years of age and live in Wichita, Kansas. I first came here in 1871 and left in 1881 and came back in 1889 and have lived here since. I am a practicing attorney here in the city of Wichita.

I first saw the Arkansas river in the fore part of September, 1863. At that time I came from Fort Leavenworth in command of a Government outfit, going to Fort Union, New Mexico. I struck the Arkansas river at or near what was then called, and I guess it is yet, Pawnee rock. It is where the Santa Fe trail came into the
6302 Arkansas River valley. And we followed right along close to the Arkansas river, except cutting off some short bends, to what was then Bent's fort, a trading post up, as I recall it, forty or fifty miles above Fort Lyon. Fort Lyon is in Colorado. We crossed the river at Bent's fort and went to where Trinidad, Colorado, is now. There was some water running in the river at that time until about eight miles below Fort Larned. There was a little creek I think they called then Coon creek. Above that there was no water running until we got to within about ten miles, I think, from Fort Lyon, Colorado. From where we first found it dry to this point at Fort Lyon there was no running water on the sur-
6303 face. There were under the banks little holes with water in them. I had 832 head of road horses, 62 mule teams, two 4-mule ambulances and about 45 cavalry and about 300 men all together; and our experience in getting water for our stock and for the use of the men was that we had to dig for it in the bed of the stream and water our stock with buckets, and that continued over this whole distance to Fort Lyon, except where we camped one night at a spring this side of Syracuse in this State. Three or four miles this side of that we came across a spring. It didn't reach the bed of the river, but it ran from the spring probably a couple of hundred yards. That is the only place we didn't have to dig for water at that time. Yes, sir, it was practically dry from there on up to Fort Lyon. Yes, sir, that was the trip when we went to Fort Union, New Mexico, and we came back over the same route. We reached Fort Leavenworth the night before Christmas in the same year. We were out a little over three months from Fort Leaven-
worth on the round trip. When we came back there was
6304 water running all the way in the river, a small stream.

The next time I came upon the river was on the 7th day of August, 1871, here in the city of Wichita, and from then I stayed here until the spring of 1881, when I went out to Gunnison, Colorado. As to that time from 1871 to 1881, I will say the last two years of that time I lived on a farm on the west side of the river on

what we call the Cowskin creek. Yes, I was practicing law during those years here too, excepting two years. But I saw the river often during those years. I won't say every day, but every week, sometimes half a dozen times or more. I had a farm over on Cowskin creek, yes, sir, from 1879 to 1881, when I lived on the west side of the river, and I came to town two or three times a week. I
6305 didn't do a great deal of work on the farm myself. Yes, sir, I saw the flow of the Arkansas river at that time. When I came back from Colorado I came back here to Wichita in 1889, and have lived here continuously since that time, on the west side of the river here in this city. My office is on the fourth floor of the Winne block on Douglas Ave. That is on the east side of the river, yes, sir, and I cross the river twice a day and sometimes three or four times a day in going back and forth from my home to the office, and that has continued since 1889, yes, sir, but I have been away a month or two at a time.

6306 As to the flow of the Arkansas river in the last six or eight or ten years as compared with those earlier years, I can simply give my judgment. My judgment is that there has been more water for the last five or six years than there was in the first five or six years I lived in Wichita, and that was from 1871 to 1876 or 1877, yes, sir. In 1871 it flowed all over the country—the river did. Aside from that I would say the last ten years would be about the same as the first ten years, outside of that excessive flood in the summer of 1877. Yes, sir, that was a great flood that year. I lived on the farm I speak of in 1877, and I know about the flood because I had to get to town.

Cross-examination.

By Mr. ASHBAUGH:

Yes, sir, I saw the flood of 1877 at the Douglas Ave. bridge. I crossed it probably twenty times during that summer. I think I crossed it when it was at its highest.

6307 My recollection is that the water reached some of the timbers of the bridge. Of course I never examined it. Any large substance floating on the flood would have struck the bridge. I don't remember seeing anything of that kind. If I was going to give my judgment I would say there were people that watched down there to keep driftwood from forming there. I think I have seen them there. The water at the highest point of that flood didn't reach the floor of the bridge, but there were timbers under the floor that reached down a foot or eighteen inches below the floor. I don't think it reached the joists running lengthwise with the bridge, but the cross-pieces that rest upon the pilings, I am satisfied it struck those, but not the joists on the floor. I remember the old
6308 bridge pretty well, yes, sir. I was here when it was built. It was built in 1872, I think. I couldn't say when it was taken down. It is not the bridge that is there now, oh, no. I think

the present bridge is somewhat higher than the other. I couldn't tell how much. It would simply be guess work. I would say it is a couple of feet higher. Yes, that would be my judgment. The surface of the ground has been changed on both sides of the bridge so that it would be a little difficult to fix that except from the water. I couldn't say the exact year when the present bridge was built. I don't know the length of those spans, but there were three more than there is now, and the bridge was then 300 feet longer than it is now. One was taken out before I moved back here from the West. That was before 1889.

That was the one on the west end. The second one was taken
6309 out about the time I came back, and the third one, it hasn't been more than five or six years since they took it out and took it up on the Little river. It has been three or four years. I think there was as much of Ackerman's island there then as there is now. Yes, there were some trees on it. As to how many, I didn't form any idea. I have no idea as to how many acres there are in Ackerman's island. I couldn't say. I think the flood of 1877 went over it entirely. I think the flood of 1904 didn't go over it entirely. I think there is some little filling up above where the old Second Street bridge used to be that it didn't cover. I think the flood of 1904 covered five-sixths of Ackerman's island. Ackerman's island don't extend as far up the river now as it did then, but it extends

farther down the river than it did originally, when I first
6310 knew it. The water at the flood of 1904 I should say came within two and a half feet of the bridge. It would be difficult for me to determine which of those floods was the higher, owing to the difference in the banks on the sides. I should think that the two floods were about the same height. I don't think there was a foot difference. (Objection.) If anything I think the flood of 1877 was

the highest. Yes, I remember the condition of the flood in
6311 1877 when it crossed Douglas Ave. at the Manhattan hotel. The street here has been filled up some since then. Paving has been put in and it has been graded. The ground was considerably lower then and the water was, I should say, deeper. Whether it was any higher or not, I couldn't say. I don't think it was any

higher. Originally, a slough ran down that street, passing
6312 through where the Occidental hotel was. As to the flow of the river last summer during the flood, it was very deep, and then part of the year it was pretty low. It was down pretty well before the flood and afterwards. I think the flood last year lasted three or four weeks. That is my recollection. I think the river during the latter part of August, 1904, had run down pretty low. I couldn't fix it in inches or feet. Yes, sir, I have seen piling under the present Douglas Ave. bridge. I couldn't tell you when I saw them first. The piling under there has been in sight, some of it, for a couple of years or more—perhaps three years. There is much more of it in sight; that is, there is much more of it above the sand now

than there was two years ago. I think that flood of last year
6313 washed out the bottom of the channel considerably. I don't know of any riffles in the river near the Douglas Ave. bridge. I don't know of any rapids there. Yes, if it washed out it simply made the river deeper. The bottom of the river would be lower, that is all. I think the first time I saw those piles under the bridge there was two or three years ago. I don't think they appeared
6314 in the '90's; if they did, I didn't notice them. I wouldn't swear that they didn't appear in the '90's. I think they have not shown in the last two or three years. I don't think they have. I think the water has been above them. I think I could safely swear that they didn't show a foot above water two weeks ago last Friday. They did show a little before this present rain came. I couldn't tell whether they showed above water last August. I was not here when the present bridge was built. I was living in western Kansas then. I lived there from 1886 to 1889. I was here
6315 in Wichita in 1879. I am not certain as to the date when the bridge was built. If I lived here I probably saw it. No, I never saw the piling from the time that bridge was built until within the last two or three years.

Examining Complainant's Exhibit A–41, if that picture was taken last August, these piles appear to show a little in this picture. The probability is that the water was not low enough during the
6316 '80's and '90's for these piles to show above the water. If the water had been low enough at any time before the '90's for those piles to show, I think in all probability I might have noticed it. Yes, those pilings were cut off under low water mark. They used to be entirely out of sight at low water. Yes, they were built under water and under the sand. That is my recollection of it. There was three or four inch plank laid on top of them and the stone abutments built on the plank. Yes, those planks show in the picture, Exhibit A–41. Those planks were about four inches
6317 thick. I would simply swear that I never saw those pilings in the '90's. They might have been in sight, though, I think. As I said before, it has been within about two or three years that my attention was called to them so that I noticed them.

Yes, I remember having heard about an appropriation made by the county commisioners toward the bringing of this suit some two or three years before it was filed. I don't recollect the time. I recollect there was talk about appropriations for the purpose of paying the expenses of this proceeding. It was several years ago; I
6318 don't remember the year. No, 1898 would not be contrary to my recollection of it.

Examining Complainant's Exhibit A–1, that looks very much like the old bridge as I recollect it during the flood of 1877. It resembles it. It was built as a toll bridge in the first place. Yes, there was a ferry here when that was built, north of the
6319 bridge. Yes, sir, I have seen a great many cattle ford or swim across the river down there. That was in 1871, 1872 and

1873, I think, after the bridge was built. Yes, I remember of the cattle being swum across the river there.

Examining Complainant's Exhibit A–52, I will say I don't recognize it. I recognize the fact that there is a long string of cattle swimming a river, but I don't locate the place. The old
6320 cattle trail crossed the river down here where the Lawrence Ave. bridge now is, a couple of miles south. Yes, we used to ford the river occasionally here below the Douglas Ave. bridge. I have seen the cattle crossing the river there looking a good deal like the drawing shown in Complainant's Exhibit A–52. I had charge of a herd that we crossed the river once down below. Yes, sir, I know Mr. J. B. McCoy of this city and have known him very well for a good many years. He was connected with the cattle business. Yes, I think he published a book upon the old cattle trail and the cattle business here. I don't think I ever read the book. I may have seen it. But that picture looks just like
6321 a herd of cattle crossing the river. That would be pretty high for the Arkansas river. I should say there was considerable flood in order for it to be up on the trees as that shows. It is clear across from one bank to the other, evidently. I couldn't say how wide the river was then, but it was 300 feet wider than it is now at the Douglas Ave. bridge. Yes, it has filled up 200 feet on the east side. Yes, I know where the Union mills in this city stand. I would say that from the east side of the Union mills it was 50 to 75 feet on made land; that is, west of the original bank of the river. The east bank of the river used to run down through there where B. F. McLain's lumber yard is now. The extreme west part of it is on made land there.

6322 No, I haven't been up the river lately from Wichita. I went up to Hutchinson several times last summer on the Missouri Pacific railroad. When we crossed the river at the
6323 Missouri Pacific bridge east of Hutchinson my recollection is that the water was probably half way across the bed of the stream. As we crossed the bridge there were some islands or sand bars, and I think some of them had brush on them, not very large trees. I don't think any of them were over a couple of inches through. They might be three or four inches through. I
6324 never measured or examined them. Up along by Colwich and Maize there are islands. As to whether those islands were there thirty years ago, I couldn't say as to all of them. I recall one island that was quite a large island. That was in the Big river, five or six miles above here. We called it the Houston island. I think it was also called the Swan island. There was a law suit about it at one time.

I don't know anything about the Government survey along
6325 the river. (Objection.) As to the banks of the river changing, I don't know as they are changing materially except where they have been filled in here through the city. I couldn't say whether they have changed between the upper portion of the

city of Wichita and the city of Hutchinson. I saw the river in three or four places, but I paid no attention to it. I was not looking at the river at all. I couldn't say that there has been any change.

As to the flow of the river, I judged simply by my observation of the river. As to its width, I guess it is as wide, except where
6326 it has been filled in. Where the sand bars form, these cottonwood seeds lodge and they grow up to little cottonwood brush and wherever the river rises again it leaves a sediment there and the island continues to grow larger and higher. As to as much water passing under the Douglas Ave. bridge in the flood of 1904 when it was at the same height as passed through under that bridge in 1877, I would answer, I don't think there was, because the river was narrower. There was a very large proportion of the water crossed Douglas Ave. a considerable way beyond the bridge at both times. There used to be a hotel there where the water got deep when the river was high. There is now a pavement there, and last year the water ran over that to a considerable depth.

Examining Complainant's Exhibit A–3, I will say that that looks like the Douglas Ave. bridge. There is an island shows here, I don't know what it is. Yes, there is a sand bar there. There
6327 are quite a lot of little cottonwoods grown up on Ackerman's island. Some of them are three or four inches through. I don't think they are more than that. They cut down a lot of little cottonwoods averaging two or three inches in diameter. I don't think that they cut down trees over there as large as six inches in diameter. I never measured any of them; I simply give my judgment. Yes, sir, I think some of those cottonwood trees two or three inches through would be thirty feet high. Yes, there are trees on Ackerman's island now fifty feet high and eight inches in diameter. They are up in the neighborhood of the Second Street bridge where there has been timber ever since
6328 I knew the place. In Exhibit A–1 Ackerman's island don't appear. Ackerman's island now reaches the bridge—the lower end of it. It was covered up north of the bridge the other day when this present flood was the highest. I think now there is bare ground clear through under the bridge. Yes, sir, I should think Ackerman's island appears plainly in Complainant's Exhibit A–2. That dark strip there, yes, that sand bar at the left hand side of the picture, yes, sir.

Examining Complainant's Exhibit A–3, I think that dark strip at the left side is the lower end of Ackerman's island. Ex-
6329 hibit A–3 is taken from the west side, and the mill that shows looks to me like the Union mills. That is my best judgment. I have no recollection about it only what I see in the picture. I don't know of any building that would appear on the other side. I never knew of any hotel being on the west side and burning down over there. As to that building at the left side being a rooming house or hotel that was located on the south side of the bridge and on the west side of the river, I will say I have no recol-

lection of such a one. As to how much water there is in
6330 the river now, and as to whether I base my judgment upon the height of the water (objection), I will say I judge by the general appearance of the river, and my knowledge of it. I don't know but I ought to explain that somewhat. The first three or four years I lived there the Arkansas river used to go dry within a quarter to half a mile of the mouth of the Little river, and it was dry except in pools now and then, and up as far as Swan's island. Well, I saw it dry that way in 1871, 1872 and 1873. I don't remember of hunting up there in 1874 or going up the river. I was hunting up there in the years 1871, 1872 and 1873. During those years it would be dry along during the fall until some fall rains would commence, and that would last, oh, for a couple of months.

I couldn't tell you how the river was in 1875, 1876, 1877,
6331 1878, 1879, 1880, 1881, 1882, 1883, 1884, 1885, 1886 nor 1887, 1888, 1889, 1890, 1891, 1892, nor in the '90's at all, nor in 1900, 1901 nor 1902. I have no knowledge of it except those
6332 three years that I used to hunt up and down the river, being 1871, 1872 and 1873. Well, along these last three or four years there would be a good deal of water in it, and especially in 1904. In 1904 it raised several times. I couldn't tell you how many. Yes, sir, I recollect the circumstances about the de-
6333 struction of life in the Eden wreck. Yes, there was high water in May, June and July and for about six months longer in 1904. A good deal of the time there was quite a good deal of high water, I know. I think the river got pretty low in the fall of 1903; that is, about the usual height of the water. There was not nearly the water in it in 1903 that there was in 1904.

Redirect examination.

By Mr. GREGG:

In regard to the land upon which the Swartz lumber yard is situated of which I spoke, I don't know who owns it. Swartz claims it. Yes, this Union mill I spoke of is near the Swartz yard. There is just a railroad track betwen the two. That is, a switch
6334 from the Missouri Pacific. The land adjoining this lumber yard was originally claimed by Bill Griffinstein. There was piling driven above this land, not far from the Union mill, north of Douglas ave., I should say a couple of hundred feet or more, and the object of driving this piling was to build it out from the east side. Yes, it was along the river when driven, right on the bank of the river. Yes, when this piling was driven, that had been lower ground and perhaps some time a channel of the river. The channel of the river was a considerable distance east of that, that is, the bank of the river. I should judge so, yes, sir, that when this piling was driven there it was done for the purpose of having that fill up. Yes, sir, and it did fill up. There was manure and trash of
6335 all kinds hauled in by one we call Doc Black, and that was done for the purpose of filling up the channel so as to make

more land build up there, yes, sir, and that is right north of the Union mill. The Union mill land was artificially filled in too. Swartz has filled in a great deal there, and a Doctor Black, and Divert, and those up above there, and I should say the channel of the river has been narrowed by this artificial filling in 200 feet. The bridge over Douglas Ave. has been shortened three spans, and I think
6336 they were 100 feet each, two off the east end and one off the west end. Yes, sir, all of the east end was originally channel and a part of the west side. I don't think all of that was. I don't think the river ever extended 100 feet west of where the bridge is now. Yes, sir, it is true that this lower land has been filled up from higher land to the abutments of the bridge. It has been filled for five or six or seven feet, some of it, and probably eight feet. And that has cut off what was formerly an old channel of the river, and the banks have been thereby narrowed artificially, yes, sir. As to the result upon the river bed by reason of the narrowing of those banks, I would say the water has been deepened there, and I mean by that the same amount of water as it would run in a narrow channel, and it becomes deeper, and I think has washed out the sand considerably. I think it has cut deeper into the channel and scoured it out and made a deeper channel, considerably,
6337 within the last few years. Yes, sir, they have been pumping sand out of that channel near the bridge there; within half a mile of the bridge there have been four sand pumps running a considerable time—there was for a good while four, part of the time. One of them has been running four or five years. When those sand pumps are running they take sand out of the bed of the stream, yes, sir. It comes out on the bank. A great deal of it is hauled away and used and a great deal of it is still there. By that process the channel of the river would be made a great deal deeper where they are pumping. They pump it as deep as ten or twelve
6338 feet. As to what effect the pumping out of this sand in the manner I have stated and the scouring out of the bed of the river by reason of the banks being narrower would have upon this piling showing near the bridge, of which counsel spoke, I would say, well, washing the sand out of the bottom of the river would expose more of them.

As to the present rise in the river, I think it commenced about two weeks ago. I guess it is more than that. I think it is between two and three weeks ago. It rose and fell, and rose again, and is flowing again, and it has kept pretty high for the last two or three weeks. (Objection.) Yes, sir, there is a full stream of water running there now.

Recross-examination.

By Mr. ASHBAUGH:

6339 As to how far down they are pumping sand below the Douglas Ave. bridge, I will say clear down to the Wichita &

Western bridge, and they have pumped sand within fifteen feet of the Douglas Ave. bridge. I say that the bottom of the river at the Douglas Ave. bridge is lower than it was. As to how I know that, I judge by the looks of it. I have never measured it at all in any way, no, sir. The same amount of water would be lower if the bottom of it was lower. No, sir, there are no riffles above and no rapids above. I think it has changed the level of the water as to the banks. I don't think that the pumping of the sand affects the forming of Ackerman's island at all that I know of, although there are two sand pumps up about the upper end of it. I don't know what effect it has had, if any. No, the pumping of sand below the Douglas Ave. bridge has not caused the forming of Ackerman's island.

6340 That was there when I came here. As to how far up the river this filling has taken place, I couldn't give the distance, but it is nearly to the mouth of the Little Arkansas river, and that is fully three blocks. I think it has been some five or six years since Swartz first began filling. The filling commenced about 1872.

Examining Complainant's Exhibit A–1, I will say that the filling don't show there. There might have been a good deal of it and never show there. The barn shown in Exhibit A–2 is on the filling, and this lumber yard is on the filling. There is that piling I spoke of. From there 200 feet east it is all made land or filling.

6341 Examining Exhibit A–2, I couldn't tell whether it shows the river 800 feet wide. Yes, sir, there are eight spans to that bridge.

Examining Exhibit A–3, I should say that the building across there stands on the filling. I can't tell you if the bank of the river today is at the second abutment as shown in that picture.

6343 CHARLES SCHAEFER, Wichita, Kansas.

Direct examination.

By Mr. GREGG:

I am sixty-two years of age, and reside at Sedgwick, Kansas. That is about six miles from Wichita. I was deputy register of deeds in this county for four years, under an old friend of mine, Mr. Brown. That was in 1887, 1888 and 1889. I held that posi-

6344 tion between four and five years. Yes, sir, I have held offices under the United States Government. I joined the United States Army when the State of Texas seceded, and of course I was promoted gradually. I have been corporal, duty sergeant, orderly sergeant, regimental quartermaster sergeant of the Third Infantry, and afterwards held the commission of captain on the frontier and commanded a company of men in the Indian campaigns. I was also United States consul at Vera Cruz, Mexico, during Mr. Cleveland's second administration. I was there four and a half years be-

6345 fore I resigned. I came to Kansas first in 1852 and first saw the Arkansas river in 1854. We left Fort Leavenworth in

July, 1854, with Fauntleroy's command and struck the Arkansas beyond the Plum buttes or what is known as Cow creek and from there we followed the river to Bent's old fort, right at the mouth of the Purgatoire. That was fifty-one years ago next July. Yes, sir, Bent's old fort was up in Colorado. At that point we left the river and went into New Mexico over the Raton route as it was called.

In 1854 the river was so high that we couldn't cross at the Cimarron crossing, which was where Fort Dodge was, and we lost one wagon master at Aubrey's crossing, up about where Cimarron is, and we continued on. The reason we took the Raton route
6346 was that the river was so high we couldn't cross it that winter when we first struck it. We left Leavenwroth in the early part of July, and as it was a large command we travelled slowly. I think we were perhaps six weeks going through. I crossed the river twice in 1860; that is my recollection; and I crossed it both times, I think, at the Cimarron crossing; that is near Fort Dodge; and the river in that year was dry. Wherever we camped I noticed sometimes we had to get out with shovels and dig for water, yes, sir, for stock, but then we found puddles now and then. Yes, we found holes now and then where there was water, just as you do now. There were fish dying in some of the holes.

I was next on the Arkansas river at the close of the war, when I was sent to Forth Leavenworth with a headquarters regiment under John Hancock, and when I left the service in 1867 I went to Fort Harker. I think the nearest point from that place to the Arkansas river would be about two miles. That fort was called
6347 Fort Zarah, and I was appointed post trader and was there a part of 1867, 1868 and 1869. As to the condition of the river and its flow during those years, I would say one year it was very high and the next it was very low. I couldn't see any difference. I think the two or three years I was there it didn't cease to flow, because—well, there were times I remember crossing up there, one time particularly, when I went over nearly dry-shod, but I think there was perhaps a yard or two of water in the river. After leaving Fort Zarah I moved up where I am now living; that is, in the fall of 1869. I bought a ranch up here on Emma creek in order to bring my cattle down from up along about Great Bend. Yes, sir, I had some cattle on the river then. That was a part of my business. I had quite a lot of cattle.

6348 I didn't buy any land at the time I located there. I didn't think the land would be good for anything only a stock range, and so I didn't even prove up on the land that I first located on. Yes, sir, I bought some land there afterwards. I bought one farm right—well, the Little river cuts part of it off. In Sedgwick county now I own 200 acres just three miles north of Valley Center, and I own in Harvey county, within a mile of the Sedgwick county line, 360 acres all together.

Oh, yes, I have been upon the Arkansas river more or less since 1869, and I have seen its flow from time to time during the various

parts of the year from that time to now. (Objection.) As to the flow of the river within the last three to five years, compared with the earlier years that I knew it (objection), I would say I can only express an opinion. I can't see that there is much difference.

6349 Taking ten years, from 1869 to 1879, and comparing the average flow of the river during those years with the last ten years (objection), I would say, well, I have crossed the river at various times in the last thirty-six years I have lived here, or nearly that, and I can't see that it makes much difference. One year it is high and another it is low. It has been so ever since I remember it.

As to the crops in these later years on this land of mine as compared with those earlier years, say from 1879 up to 1889 and

6350 1890 (objection), I would say my land, that which I own on both sides of the Little river, I don't know but what it produces fully as well as when it was first broken up. I think the nearest point of my land from the Arkansas river would be perhaps five or six miles. (Objection.) Taking that land as to the crops grown there now as compared with earlier years (objection), I would say from a money standpoint it has improved. That is, I get more money out of it than I did then. As to getting as good crops now as I did then from this land (objection), I would say no, I got nothing last year, because it overflowed, but on the average I get fully as much if not more.

6351 Yes, sir, I should think I am pretty well acquainted with the farmers up and down the valley of the Arkansas river. Yes, sir, I know quite a number living right along the Arkansas river where I am. As to whether I ever heard any complaint from those farmers prior to the bringing of this suit to the effect that their crops have been injured by the falling of the underflow, I would say I believe I did hear that discussed once, and there were one or two gentlemen took the ground that—well, that is prior to this suit—I remember talking about that with some of them and the question came up as to why we had more moisture and some fellow held the idea that it was because of the water in the big Arkansas river and some other fellow disputed that, and one man said he had a piece of land running right out into the river that was sandy that he thought produced better crops when the river was full. I remember that. Yes, that was on some low land that projected out into the river. (Objection.) I don't remember of hearing any other conversation about it.

6352 As to whether prior to the beginning of this suit I ever heard any of the farmers complain to the effect that their lands or crops had been injured by the lowering of the water level, I would say I believe, sir, if you will allow a western expression, it is about a stand-off as to the injury or benefits received from that high or low water. Yes, sir, I have heard a little somethir.g both ways. I have heard when the river was up it would drowned out certain crops and when it was low it would dry them out. The underflow was very little discussed before I heard anything of this suit.

No, sir, I have heard no complaints of that kind, because of a fall of the underflow, not that I remember, but I may have heard of it. No, I don't think I have heard any complaints prior to the bringing of this suit that crops had been injured by the falling of
6353 the underflow. As to my having had experience in the matter of digging wells that would give me any knowledge as to this matter, I would say I have had wells in my corral and near the store and residence, on the Walnut. I suppose it was two miles from the Big river. I think I dug down there somewhere between twenty and thirty feet, I wouldn't be certain, but near the river I wouldn't have to go more than from four to six feet to get water. As to noticing any material change in the water level during those years, I wouldn't know. You see I haven't lived there since 1869. Well, I have been there from time to time. Once in a while I have been at Great Bend looking over the country. I have ridden over that land where these wells were to look at some old land marks and notice- the difference in the sand hills being covered with weeds and plum brush that were formerly bare hills, etc. No, sir, I
6354 can't say that I have noticed any change in the water in my wells on these lands. The well I dug up there, I think thirty-four years ago, is still flowing and is just as good a well as when I dug it, and that was perhaps six miles from the river. I went down somewhere between twenty and thirty feet for water. I wouldn't be certain. As to whether I noticed any change in this other well where I said I went forty-six feet, I couldn't tell you anything about that, because I didn't notice it. I never thought of such a thing. So far as my opinion goes, I can't see any change in the water level underneath the surface—any difference. (Objection.)

Cross-examination.

By Mr. ASHBAUGH:

6355 Yes, I struck Cow creek in 1854, and we had trouble in crossing the river because the water was too high, both at the Cimarron and the Aubrey crossings. I couldn't tell you how long that high water lasted, because it was all the way up the river. It must have taken us two weeks or more to get to Bent's Fort, and wherever we tried to cross we found the water too high and quicksands too bad so that we couldn't cross. I was then in my twelfth year.

6356 Yes, sir, I was at the Cimarron crossing again in 1860 and the river was then almost dry. That was on the 7th of May, and it took me ten days to go to Arkansas City. And then I recrossed it, and that must have been in September. It may be that when I found the river dry at Cimarron crossing it was in September, 1860. 1860 was the driest year I ever saw in Kansas, I believe. Yes, I think it is correct that it is so known in the history of that State and Territory that 1860 was the driest time ever

known, and I believe that drouth lasted longer than any other drouth in its history. Yes, when I was up at Fort Zarah from 1867 to 1869 I sometimes found plenty of water in the river.
6357 The June rise is what we calculated on to bring in the water, and we prepared for it, because at that time I had quite a lot of hay up. As to what I mean by the June rise, I suppose it was caused by the melting of the snows in the mountains, because we always expected a June rise, that is, high water, in the month of June from the outpouring of the water shed there in the mountains. This rise may have been a little later sometimes. It would depend upon the snow in the mountains as to when that melted, because this highest water I ever saw prior to my moving down here was in 1854. That was along in the month of July and part of August. Those rises would last anywhere from a week to two or three weeks. I couldn't tell exactly. If you had
6358 been in the mountains you would have seen those torrents, and you know how they come. They come with a rush and go away with a rush. We would have a wall of water four or five feet high that would come down and in a day or so you could go to the same place and find that water was gone. No, sir, it is not according to my understanding that these rises were caused by rains from the west. (Objection.) And they were not caused by rains in Kansas, I think.

Yes, I settled in Sedgwick county in 1869, in a little village up here called Sedgwick, right on the Sedgwick-Harvey county
6359 line. The 360 acres of land I have up there is on both sides of the Little Arkansas river. The town of Sedgwick is on the north or east side of the Little Arkansas. No, I never knew the Little Arkansas river to go dry and never heard of its going dry. My place is five or six miles from the Arkansas river.
6360 I sometimes during the years I live up there come to Wichita. I am acquainted here. I buy quite a number of things here. While doing business up there we were supplying the Atlantic & Pacific railroad with grain, flour and stuff of that kind. I have done business in Hutchinson, and would go there once or twice a year. Sometimes I would come to Wichita once a
6361 week or sometimes not for three or four months. In coming to Wichita I don't cross the Little Arkansas river. I keep on the northeast side of it all the way down. Certainly, in coming to Wichita from Sedgwick we don't strike the Arkansas river. I cross it at Wichita often at the Douglas Ave. bridge. I some-
6362 times cross it over here at the water works. They have a bridge there. That is a couple of streets above the Douglas Ave. bridge. During these later years I have not had occasion to see the Arkansas river above the city of Wichita as much as formerly. I would go over there duck shooting and one thing and another and saw it frequently in the early years, but of late years I am getting old and don't do so much of that, and perhaps I wouldn't

see the Arkansas river more than once or twice a year, or three times a year, in the last three or four years.

As to whether the underflow from the Arkansas river extends across the Little Arkansas river (objection), I will say, why that is a question that has been debated here by myself and others on account of the depth at which we find water on the north or northeast side of the Little river. We generally find three strata of water, and the lower stratum is something between forty and fifty
6363 feet. (Objection.) I am satisfied that the underflow does not get to the east side of the Little river, as you go deeper for water there than you do a mile or two from the Little Arkansas river on the west side or the southwest side. As to how near the underflow comes to the west side of the Little Arkansas river near the town of Sedgwick, I would say I would not place it over two or three miles. Yes, there are springs along the Little Arkansas
6364 river—one that I have in mind that comes out on my farm on the east bank of the river, but it is close to the river. At low water or at the average stage it is perhaps two or three feet above it. In the early days we used to seine a great deal, and then when we struck spring water you could tell the difference in the temperature, and in seining up the river for perhaps two miles or more below Sedgwick to perhaps the same distance above, we very often came across cold clay strata in the Little river that indicated that there was a flow of water of different temperature down there from what there was in the balance of the stream. I don't fish much in the later years. Others do. They don't seine that I know of, and if they did I don't care to tell it.

No, I think the underflow is not perceptible on the east side of the Little Arkansas river, from the big river. As to it being noticeable on the west side of the Little Arkansas river, well, a
6365 great many people say that when the river is high the water rises in their wells. If that is what you call the underflow, why, yes, sir. I never looked down a well that I know of, but I have heard a great many who hold that. They say it goes up and down. (Objection.)

As to what I said about the effect of high and low water being about a stand-off, I will say, the seasons, taking it one with another, for a series of years, it would be an average. That would perhaps be a better word. One year dry and another wet. And
6366 taking it for a series of years, it evens up or averages things.

As to the rise in the Arkansas river making better crops on the west side of the Little Arkansas river when the river is up than when the Arkansas river is down, I can't answer that properly because I really don't know. I have heard both sides of it, and it is pretty hard for me to tell. From my own experience I don't know. Yes, sir, I have dealt in corn all the years up there at Sedgwick. As to whether the corn crop on an average on the west side of the Little Arkansas river has been in the earlier years better when the season was dry so far as rainfall was

concerned than when the Arkansas river was up and the
6367 underflow nearer the surface (objection), I will answer, I can't tell in what years I bought the most corn. I don't remember whether the river being up or down cut any figure in the amount of corn that was hauled to Sedgwick. As to whether I ever bought corn from any man who owned land along the Arkansas river during a dry year so far as rainfall is concerned (objection), as I said before, I don't remember. We bought corn there. There was hardly a year but what we bought corn from the farmers living on the west side and on the east side. There was more corn came from
6368 the west side. It was a better corn country at first. I don't know why it was better, but I know that in the first place the soil broke up easier. It was not so heavy and soddy. It was easier to cultivate than that on the north side of the Little Arkansas river. That on the north side is better adapted to small grains; that between the two rivers is better adapted to corn; although I will say that I own a farm that the Little river runs through and the man on the place raises 80 bushels to the acre of corn, on the east side of the river, but it is in a bend where it gets a great deal of dew from the river—moisture—and right across the river where the larger fields are it didn't average 40 bushels. I thought it was simply because the hot winds hurt the corn on the west side of the Little river, but the corn on the east side was protected somewhat by a belt of timber on the Little Arkansas river, and the water, over which it had to blow. As to whether I have ever known of farmers from the east side of the Little Arkansas river going across and buying corn from farmers on the west side of the Little Ar-
6369 kansas river but east of the Arkansas river (objection), well, this year I have known people to come from around Newton down to Sedwick and even to come across the river to buy corn. That is a thing that happens every year, because they don't raise any corn up in that section of the country to amount to anything. Yes, I think the best corn country is between the two rivers. There seems to be a strip of land between the two rivers that is about as fine corn land, and after you get across that section or so you strike poor land on both sides. In that belt you raise fine corn, while on both sides it is not so good. During a dry year so far as rainfall is concerned, as to what kind of a corn crop in the early days they raised on that land between the rivers (objection), I will say in the early years we had a great deal of rainfall here. In 1870 and 1871 this valley was almost impassable, and that was followed up by seasonable rains. I don't know how much the river had to do
6370 with that crop. But as to your question, I can't tell. I don't know. I know they raised corn there every year. That is my impression, because I have bought corn from those people over there. I think during the earlier years they raised corn every year between the two rivers, unless it happened to be a year when there was hot winds that cut the corn short. I don't think I ever saw a

year when they didn't raise a little corn. During the earlier years I think there was perhaps two or three years when there was a lack of rainfall sufficient to mature a crop.

When I dug a well away out on the Walnut at Great Bend I made no observation as to the underflow or the height of the
6371 water level, and I didn't mean to so state in my direct examination. Yes, I found water at other places on the Walnut river three or four feet deep. It seems to me that going down there in the hay field in those swales and places we didn't have to go over four to six feet to water. It was in the haying season we were there. I never dug any wells at any other time. My wells were perhaps two miles from the river.

Yes, I spoke about some land overflowing in the year 1904. I don't think that the Little Arkansas river had as much to do with it as the Emma and Sand creeks which flow into the Little Arkansas river. Oh, yes, the Little Arkansas river was high in July, 1904. It was high several times. These floods came from heavy
6372 rains or cloudbursts. Yes, it was reported that these little streams that run into the Little Arkansas river overflowed their banks at that flood. This overflow swept away 160 acres of my land, everything on it, but left a sediment there that I considered repaid me for the loss of my crop. (Objection.) That was from the Little Arkansas river and Emma creek. These floods were caused entirely by local rains extending ten or twenty or thirty miles away. Those wells up on the Walnut must have been dug in 1868.

Redirect examination.

By Mr. GREGG:

6373 Yes, sir, I have been buying grain in Sedgwick county and am acquainted up and down the river with the farmers generally. As to being acquainted with the values of land along the Arkansas river north of Wichita and between Wichita and Hutchinson, I would say I am not so much acquainted as I am nearer the Little Arkansas river. Yes, sir, I know the values of land along the Arkansas river in the vicinity of Sedgwick, and those lands of later years as compared with former years have increased in value tremendously. As I made a statement generally, I think good land has fully quadrupled. I think I am within the limit. I think the values of lands along the river up there are fully as high as they have ever been. Well, fully as high. There was a time in the boom days, you know, when people went crazy on land and it took a spurt, but excepting the boom days I think it is just as high now.

Recross-examination.

By Mr. ASHBAUGH:

No, I think Newton is not as large as it ever was. It may have gained in population since the shops moved from Nickerson.
6374 No, I think the improvements up there are not greater than they were before. The hedges are larger, but I see old houses standing there that have been standing there for twenty or thirty years. Oh, yes, there have been general improvements on the farms. I think the land has increased in value. I think
6375 the improvements are better. Of course Wichita is much larger than it was thirty years ago. There is no comparison at all. Where I live we have the same railroad that we had twenty years ago. But the railroad facilities and markets in Harvey and Sedgwick counties are now better than they were in the early years, and the country all around here for a great many miles has
6376 improved very greatly within the last twenty years. Yes, I think land values have increased four fold. Yes, I think the improvements cut some figure in the price of land, and where the resident owns the farm the improvements are better throughout Sedgwick and Harvey counties now than they were then. Where he is a renter they are not.

Cross-examination.

By Mr. CAMPBELL:

We found that the season of 1860 was a very dry one in Kansas. As to how far the drouth of that year extended westward, I will say that in the first place—understand that the last place that we found anyone was at Council Grove. I think that was the outer settlement, but I noticed both in going and coming—I sup-
6377 pose it is now McPherson county or the county east of there—I couldn't tell exactly—but I couldn't tell you how far the drouth extended westward.

6378 F. M. DOFFLEMYRE, Wichita, Kansas.

Direct examination.

By Mr. DAWSON:

I live ten miles from this city, northwest, and am immediately on the Arkansas river. My land abuts on the river for approximately over half a mile. I am engaged in farming. I am sixty-three years of age. I first came to Sedgwick county and became acquainted with the Arkansas river in the fall of 1874. I settled about a mile and a half, I should judge, from the river. That was about a mile from where I now live. I located upon my present place in
6379 the spring of 1877. I am farming 160 acres of land where I now live.

I was representative of the western district of this county in the legislature of 1881. Since 1874 I have had a continuous acquaintance with the Arkansas river. Yes, sir, the place where I now live is so located that from day to day or week to week I have an opportunity to observe the Arkansas river.

As to the average flow of the Arkansas river in my locality covering a period of the last ten years as compared with the flow of that river in the same locality for a period of ten years in the earlier times, as near as I can judge from the overflow I have had on my place within the last eight or ten years there has been very little difference in the flow of the water. I have been overflowed oftener in the last ten or twelve years than I was in the twenty-five. It overflowed this last rise in the river, a portion of it anyway. Aside from special times of high water, as to the average flow for a period of ten years as compared with any former ten years, that is, for the total ten year periods, I don't know as I could notice any dif-
6380 ference in the amount of water. My land is first bottom, and I have been engaged in farming that same land since 1877.

As to the crops produced on the land now compared with those produced in the earlier years, taking a period of five or ten years in the later period and comparing it with a like length of time in the earlier period and making allowance for the natural deterioration of the land, if any, I should think there was about an average. Of course you take it in the early part of my settlement there, we had a period of seasons that were excellent for crops. Of course my land was all fresh at that time. Yes, sir, I think it is true that new land, other conditions being equal, will produce more than old land. (Objection.) Well, I don't know as there has been any falling off of crops in the later years as compared with earlier years because of a change in water conditions, either the ground water conditions or the precipitation, other things being equal. Last year I was injured by too much moisture. I didn't raise as good a corn crop as I did the year before. The year before I raised perhaps as good a corn crop as I have raised since I lived on the place. I depend in
6381 my locality upon the rainfall to make a corn crop. If we have good and seasonable rains we have good corn; if we have poor or unseasonable rains we have corn not so good. As to whether the flow of the river on my place regardless of rain in that locality affects the production of my crops, I will say it don't on my place. I will just state in reference to my place that most of it is underland with a sub-soil that is totally impervious. Some call it hardpan, but it is not a hardpan but of a clayey nature. You will find that formation all through this valley. The water can't penetrate to the surface; while on the lower land next to the river it will ooze up through the land when the river comes up, and still at the same time not be an overflow; it will stand in clear pools of water coming up through the ground where this hard, impervious subsoil lets it through or rather where the hard soil doesn't exist and

where it can get up through for that reason, yes, sir. As to
6382 whether on the very low land where these pools appear the river has any influence on that, I will say, well, yes, there is more water, of course. As to how far back these lands run which show the influence of a rise or fall of the water in that locality, I would say just immediately along the river on my place. And that extends from a hundred to three hundred yards back from the river. No, sir, I don't use that ground for corn; I use it for pasture. Generally speaking, that is true of that character of land up and down the river in my locality. It is generally used for pasture. On my land where my house stands about half a mile from the river I generally strike water in about five feet, or the length of a post auger. As to whether I have noticed any change in the level of the ground water since I located on that farm, I would say I have noticed practically none.

As to the values of land in my part of Sedgwick county now compared with earlier times, as a matter of fact all lands through that section of the country are much higher now than they were fifteen or twenty years ago, certainly, yes, sir.

6383 If the river were high during a summer but we didn't have any rainfall scarcely, as to whether I would be able to raise any crop or not, I would say, no, sir. Yes, sir, I have raised good corn crops on that place when the river during a dry season was low—some of my best crops. But in that instance there was plenty of rainfall. As to whether I have ever raised any poor crops when the river was high, I would say I did last year. I had too much of it. There has been considerable water running in the river for the last twelve months. It sometimes, opposite my place, goes dry—stands in pools. You can walk across it in places dry-shod, but I don't think—in fact I know that it has not stopped running in the last year, and in fact I don't know but what I might
6384 say within the last two years. I think the first time in my recollection that I saw the Arkansas river dry so that I could walk across it dry-shod was the season I came here, in 1874. I think likely the river practically stopped running. And then again in the year 1879 or 1880. In 1877 and 1878 we had considerable water in the river; in fact I don't believe it stopped running either one of those seasons. That was in 1879 or 1880, I think, and perhaps a time or two since that, a little later on. Well, I don't know as to its having gone dry or getting extremely low more in the last ten or twelve years than it did in the first ten or twelve years I knew it. I don't know that it has. I don't think it has. Yes, sir, the stream is a stream of high and low water—a very changeable stream. The character of the bed of that stream is sandy and the character of the banks underneath the sub-soil is sandy. The banks are not so high. It is a stream with low banks, yes, sir.

6385 As to what effect, if any, the plowing up of the lands along the stream has had in filling the stream in in places, I would

say, well, by heavy winds such as we had yesterday it has a tendency very much to lodge sand in the bed of the river. I have noticed it opposite my place sometimes where it would drift in with a heavy wind like we had yesterday from the fields adjoining, that would fill in quite a bank of sand all along in front of my place. As to how that country was as to blowing or drifting sands before it was in cultivation, while it was in a natural state and with the growing of grass, of course there was very little of that.

Yes, sir, I am pretty well acquainted with the farmers up and down the Arkansas river in that vicinity. As to whether before the commencement of this suit I ever heard any of the farmers along the Arkansas river in my vicinity complain that their lands were being made less valuable or less productive by the sinking of the general level of the ground water, I would say that I don't remember that I ever did in my locality.

Cross-examination.

By Mr. ASHBAUGH:

In coming to town I generally drive in with a buggy and now am crossing the river on Douglas Ave. from the fact that the bridge on Thirteenth street is out of repair. The river has been all
6386 out over the bottom on the east side along by Thirteenth street, and it is in very bad shape. Yes, I crossed the old wooden bridge on Douglas Ave. and have a distinct recollection of it, and I have been crossing the iron bridge ever since it was built. Yes, sir, I remember Ackerman's island in the river down here. As to its getting larger in later years, I will say it has gotten larger, yes, sir. I crossed the iron bridge this morning. I think there is a little point of Ackerman's island that extends a little below the bridge, maybe. I think that is true. Yes, I think Ackerman's island extends twenty-five to thirty feet below the south side of the Douglas Ave. bridge, today. Yes, there have been quite a good many trees on Ackerman's island, and some of them have
5387 been chopped off below the bridge. Right near the bridge on the north side they were cut down about a year ago. The trees on Ackerman's island run from small trees the size of your arm up to perhaps five or six inches in diameter. Perhaps some of them are larger than that. I don't know. As to how long these trees have been growing there, I should judge fifteen or sixteen years perhaps. In the neighborhood of that. I couldn't say exactly. Yes, I can remember when there was practically no island there, or when it was a very small affair anyhow.

Examining Exhibit A–1, I will say, yes, sir, I recognize
6388 that as the old wooden bridge at Douglas Ave. Yes, sir, that picture shows what there was of Ackerman's island at that time, I guess. Yes, sir, that is a good picture of the river as it was from the time I knew it first down to 1879. Yes, sir, that old

wooden bridge was taken down in 1879 and the iron bridge built in the same location.

Yes, I recognize Exhibit A–2, and I can see Ackerman's island or the beginning of it, there. That picture represents it tolerably fairly. (Objection.) It was a sand bar then and it would be entirely covered when the river would be high.

Examining Exhibit A–3, I will say it doesn't show Ackerman's island. Yes, when that picture was taken Ackerman's island
6389 was below the water. Yes, sir, Ackerman's island has all grown up within the last fifteen or twenty years, so far as the island is concerned, and at low water at that time it appeared simply as a sand bar. Yes, sir, I think so.

As to the river banks being narrower up at my place in the last fifteen years, I will say, yes, sir, by the filling in of the channel that formerly ran around an island north of my place. A man there drove some posts at the upper end, and that eventually filled in, and there is some made land there now, and it has never washed out since that time. I can see but very little of the river coming down there.

As to the islands increasing in number in the last few years, I think they have, and some of them have increased in size, but some of them have increased while some have gradually decreased—washed away—in time of high water. I don't know that those same ones increase in time of low water. You see the channel of
6390 the river shifts and changes. By this man filling up the channel that formerly ran around in times of high water on the north side, it has thrown the main part of the channel over next to me, where there was formerly a little island that stood in the river. It has been practically washed away and added to one below it. As to the river between my place and Wichita having changed in the last fifteen years, I will say the banks are not so high and the river has filled in more or less with sand. I will just state, however, that along by my place there used to be some high banks. There was a ridge of mounds that ran along parallel with the river. When this man on the opposite side of the river filled in over there and threw the current on this side, it washed that high bank away. The farther back it washes the lower the land becomes and the lower the banks. I think the river bed has been gradually filling up with islands in the last fifteen years. As to the carrying capacity of the river being as great now as it was twenty years ago between the banks, with the water at the same height as judged by the banks, I will say, no, sir, I wouldn't think it would be on account of the islands. As to what effect the filling of the river channel
6391 and the narrowing of the banks has had upon overflowing my land with the same amount of water in volume coming down now or twenty or twenty-five years ago, I will say I couldn't answer that question positively from the fact that within the last three years those high banks I speak of, this ridge of mounds running along there, cut it off at any of the high overflows we used to

have, but now that has all broken into the river. I should judge there has fifteen or twenty feet for maybe three or four hundred yards filled into the river this last freshet, when it ran over across my pasture, while several years ago when we had a high freshet perhaps there was two and a half feet of that bank below water. As to the banks of the river having narrowed from the mouth of the Little river up as far as I am intimately acquainted with the river, I will say it has narrowed in places considerably, in some places not so much. The banks have been giving way, first on one side and then on the other. Yes, sir, the islands have grown up in the channel of the river. As to the carrying capacity of the bed of the river being as great now or in the year 1903 as it was twenty years ago, I will say, no, I should judge not, from the fact that the bed of the river has filled up very materially with sand and the formation of these tow-heads have
6392 affected the flow of the water. As to this filling up of the bed of the river and the narrowing of the channel having been artificial, I will say, well, no, I can't say that it was artificial. Parties have interfered to some extent, like this man I speak of, in various places along the river. I think there are two or three such places that I know of, and they are perhaps within four or five miles. I am not one of those parties myself. When I first went onto the place there was an island of perhaps ten acres that lay right at the foot of my land. At the high stage of water the water ran through there, and one day I was passing along there with my ax—perhaps that was in 1878 or 1879—and drove some stakes in it right at the upper end, and the first thing I knew there was some trash lodged in there and that channel filled up, and then when I went to fence my pasture I went to see the land commissioner about fencing that tract of land, and I supposed I would have to have it surveyed and reported to the Government. I didn't do that for the purpose of narrowing the river, no, sir. Yes, sir, all along the river that has been taking place for the last fifteen or twenty years.
6393 During the flood of 1904 I had very little water at that time with the exception of this former island where I drove the stakes. I think maybe it got high enough to run over that some. During the flood of 1877 there was less water on me than this last rise in the river, from the fact that these high banks have now gone down into the river and cut it off. Yes, I remember the flood of 1877. The river was wider then. At that time in 1877 a large portion of the channel ran around north of this island where I spoke of closing it up. That made it, of course, quite a wide river. Yes, sir, the carrying capacity of the river at the flood season in 1877 was much greater than at the flood season of 1904 at my place. Yes, sir, the same amount of water coming down in 1904 would do me a great deal more damage by overflow than in 1877, because I lost my high banks.
6394 As to how much of my land is underlaid with hardpan or gumbo or that impervious stratum, I will say it extends under the greater part of the land I am cultivating, but at different

depths. In some places you can strike it at twelve inches and in some places you could hardly reach it with a post auger, owing to the depth of the sub-soil that is over it. Yes, sir, it is practically impervious. Such deposits as that occur generally along the river. Yes, there are some places of them. There are some places on my farm in the first bottom where the ground is up high— Yes, sir, where this hardpan or gumbo doesn't appear in my land, it is affected by the rise and fall of the river. It comes up there and stands in pools. Upon this bottom land, it would be useless to put
6395 a crop on that. Take it now in this last rise of the river, if I had a crop on that it would be perfectly miry. I couldn't cultivate it. There is water standing there that would kill the crops; and that was the condition on a good portion of my land last year. I think last year was the wettest year ever known in Kansas, so far as the flow of the river was concerned. There were more floods coming down the river from the upper reaches of the river, and more rainfall. I think from about the tenth of April to the tenth of July in the neighborhood of thirty inches of water fell. We had some rains where five inches of water fell. Yes, this flood of 1904 was caused largely by local rains. I don't know that there was any flood coming down the river from Colorado at that time. Yes, there were such floods as that later in the season. I think in
6396 the year 1900—that was our dry season—we had comparatively a dry season. I think at one time there was quite a flow of water in the river. It got up nearly bank full. But I think that was out of the ordinary for the Arkansas river. My recollection is that the corn was earing out. It commenced earing. And the river ran over a little above my place and came down across Foster's and Russell's places and emptied into my place and I conducted it into some corn furrows with a spade. I think that was in August. It was very dry here at least. We complained very much of the dry weather. I couldn't state positively about the dry season in 1901. We generally have freshets at some time in the
6397 Arkansas river every year. They come in different periods. After the flood of 1901 had passed perhaps there was an ordinary stage of water. I can't say exactly. I think there was water in September, October and November, because I watered my cattle out of the river. The pasture runs through the river, and I had a place fenced off along the bank of the river where they generally got water. I think in 1902 the water got pretty low. That is my recollection. During the last five years of the '90's I always had water down there at the east end of my place, along the river. I think there was flowing water in the river during the five years from 1895 to 1900. I don't remember that the water ever stopped running immediately opposite my place, but I think maybe a mile and a half below there the water did cease running altogether. I think I went across one day when the water wasn't running, but it was running at my place and sank away in

the sand between me and the other point. No, I never knew
6398 the river to go dry at my place but what there was some water in sight somewhere. I think that didn't occur even in 1879. During the '70's we had it generally pretty dry along in July and August. That is what we generally considered our dry season. Outside of the flood season, for the ten years from 1874 to 1884 as compared with the ten years from 1893 to 1903, I don't know as it is so much different. Of course I remember a good many times along in 1871, 1872 and 1873, during the dry periods in July and August, crossing the Big river, and I would go across on foot, and of course you could cross it anywhere with a horse during that season of the year. But for the ten years from 1893 to 1903, excluding flood seasons, I don't know as there is quite as much as there was from 1874 to 1884 or from 1880 to 1890. I think, however, in the last three or four years, taking it on an average, there has been more water running in the river during that period than for the same number of years prior to that. But during the
10-year periods that you mentioned I don't think there was.
6399 Yes, during the last three years I have been confronted with this flood period of 1904 that was so disastrous. If the river decreases in its flowing capacity, as to what effect it would have upon my land and the land of my neighbors along the river, I would say very little effect on the cultivated land. On the pasture lands perhaps it has. If the flowing capacity of the river has continually decreased, as to whether when the flood does come it will not do more damage than in the earlier years, I should answer, well, I
should say it would. It would overflow worse. Yes, we are
6400 troubled at the present time with the overflow of waters. If the same amount of water show now come down that would come down thirty years ago, as to whether that would overflow a great deal more land than it did then, I would answer, yes, I suppose it would.

Redirect examination.

By Mr. DAWSON:

Yes, the reason I lost that high bank of mounds was because of the fact that my neighbor on the other side of the stream narrowed the carrying channel of the river by attaching an island to his main land. (Objection.) I should judge there were eight or ten acres, perhaps, and maybe more, of land formed on my side of the river by the driving of the posts which I spoke of heretofore, in the channel, which has since been closed up. In width, at the place of greatest width, as to how much that process narrowed the channel of the river before it widened by cutting off on the other side, I would say,
in time of high water—and the water didn't have to get very
6401 high either to run around that island—there was a channel varying perhaps from thirty to forty feet wide—perhaps

wider in places. Yes, sir, the effect of attaching the island of some ten acres to my main land was the narrowing of the channel.

As to the islands having increased in number and size in the river channel from my place to Wichita, I would say that might be attributed to several things. The seeds fell there and the sand bars being damp and sometimes left with a kind of soft muck from the flood that receded and passed by, that readily took hold, and it was not long before they formed a bed of roots there, and the sand blowing as that grew up, it drifted in there and finally formed a tow-head. That is one of the things that starts tow-heads in the river. I mean by tow-heads the beginning of little islands, yes, sir.

No, sir, when I first settled in this country it was not timbered to the extent that it is now. There was very little except along the Little Arkansas and the Big Arkansas rivers, and the variety
6402 of trees first planted by the settlers was generally cottonwoods. As to what kind of a seed the cottonwood has with reference to its ability to travel on the winds, I would say, well, it is of the nature of cotton; and as to the length of time in which the cottonwoods generally planted over the country by the inhabitants had reached sufficient size to supply large quantities of seeds that could be carried on the winds, I would say, oh, running from ten to fifteen years back. Along there. As to how long this growth and the increase of these islands in the river channel has been noticeable, I would say for the last fifteen years.

As to what has been my observation in the last thirty years as to whether we would have a certain cycle of years in which the flow would be greater and then a cycle of years in which it would be less, I would say, well, I don't know, but that has been the history to some extent. You take it in 1876, 1877 and 1878, we had considerable water; then it dropped off; and my recollection is that there
6403 was perhaps pretty nearly the same number of years we hadn't the flow of water—that is, floods to the extent that we had during those years. I think perhaps maybe it runs a little that way. As to how the last five years would compare with some of the earlier 5-year periods, I would say the last three years we have had a pretty good flow of water in the river; that is, it has never gone dry to my knowledge, and I would think that period would compare favorably with the 3-year dry periods. Perhaps there would be more water in the last three years that I speak of than there would several years ago in the three years of a moderately dry season or dry period, if I understand your question right. Yes, sir, the last three years compare more nearly with one of the wetter 3-year periods than with one of the drier 3-year periods. The last two years, we have had perhaps a more continuous flow of running water, or a bigger flow of water, than we have had for several years past. Tak-
6404 ing into consideration these cycles of dry years and wet years, on the average, as to what I think of the river as to its being generally as much of a stream of late years as it was in the earlier years (objection), I don't think the river bed will carry as much

water, generally speaking, in the river, as far as I am acquainted with it, as it would in the earlier periods, from the fact that it has lost, as I said, a great deal of its banks by caving in and the filling up of the river bed. As to the general flow of the river in late years as compared with earlier years, that is, the amount of water flowing, whether it would get as high or low, on an average, I would say, oh, I don't know as there is much difference.

Recross-examination.

By Mr. ASHBAUGH:

Oh, yes, some of the cottonwood trees along the river twenty or twenty-five years ago furnished cottonwood seed up and down the river.

6405 Most of those banks I spoke of along my place having gone into the river have been within the last two or three years, and the flood of last year did a great deal of it. Those banks are underlaid with quicksand.

6406 JOSHUA RUSH, Wichita, Kansas.

Direct examination.

By Mr. GREGG:

I live in West Park township, this county, about ten miles from Wichita. That is up the Arkansas river. My place is in the neighborhood of four miles from the Arkansas river. I am farming for a living and have been farming all my life. I first came to Sedwick county in 1879. I commenced farming in this county in 1880. The land that I first farmed was in Union township, right is the northeast corner, and that was forty or forty-five acres that I farmed. The river cut off a little bit of the corner of it. Yes, sir, that

6407 was bottom land. My house was about 150 yards from the Arkansas river. I grew corn, principally, on that land for two years.

I had to go something like there feet to the first water level.

The first year I was on that place I raised fifteen hundred bushels of corn. The next year I had a good crop, but I don't know just exactly how much I had. As to whether those years were wet or dry so far as the rainfall was concerned, I am not dead sure how much rain we had that year, but I think we had pretty fair seasons. After 1882 I lived at another place about a mile away from there and about a mile away from the river, yes, sir, and I lived

6408 there five years. Yes, sir, I farmed that land during that time, and I raised pretty fair crops there, of corn. I have lived in that neighborhood ever since 1879. Well, no, I wasn't upon the river often during those years. The first seven years I was in

the vicinity I was around the river considerably; since that time I have not been around the river as much as some people. I have been to the river, though, more or less every year. Yes, sir, I have seen the river quite often in the last five to seven years, but not as much as I did in the first seven.

As to the flow of the Arkansas river during the first seven or eight years that I saw it compared with the last seven or eight years (objection), I can't see any difference between the river in the
6409 first seven years and the last seven years, and that applies to the dry seasons of the year as well as to the time when they have the rises in the river. As to whether or not I depended at all on the rise or fall of the Arkansas river when I was farming those bottom lands or raising my crop of corn (objection), I don't depend upon anything else but the rainfall for my crop, and I didn't depend upon anything else at the time I was on that farm, no, sir. (Objection.)

6410 Yes, sir, I know some farmers pretty well up and down the river there next to where I farm, and I know a number of them living along that river now, yes, sir. As to whether before the bringing of this suit I ever heard any of those farmers complain that their crops had been injured by the falling of the water level or underflow, I would say, no, sir, and I didn't hear them complain that their land was injured in any way by the falling of the water level. Yes, sir, I own thirty acres of my own land and have been farming there for the last seven or eight years. Yes, sir, I recollect that there have been some years when the river was high and yet the rainfall was very small, and as to my corn crop during those years, I would say I came pretty nearly having none that year, although the river was high, yes, sir.

Cross-examination.

By Mr. ASHBAUGH:

6411 I have owned that thirty acres of land something like ten years. I have never owned any other land in this county. Yes, sir, I rented at the time I came down here until the last ten years. That thirty acres is in the neighborhood of four miles from the river. Yes, during the last seven years I have been four miles from the river, but I have been to it a good many times during those years. In coming to Wichita I cross on the Thirteenth Street bridge. My thirty acres of land is right on the foothills. I don't call it first bottom and I don't call it upland. It just branches out
6412 against the hill. It is sandy land. Where my pump is it is about eleven to thirteen feet to water. I have a drove well. The land that I farmed down near the river in the earlier years here is low, bottom land. Some of it was wet and some dry. Some of it was black, heavy land and some of it was light, sandy land, and one place where the river got high it overflowed three or four acres

When the water was there I could do nothing with that kind of land.

6413 I said four years ago we didn't raise hardly anything. Yes, sir, I was farming that thirty acres of land too. The reason was because it didn't rain. I don't consider that the flow of the river affects my land back four miles. I don't think that the land down near the river was affected. Very little if any. The water under the land didn't rise or fall with the rise or fall of the river, no, sir. Well, now, I will say that it does to a certain extent. Just as quick as the water comes back through the earth it will rise, and just as soon as the water stays up bank full and keeps backing back, the water will rise, and to a certain extent the land becomes saturated from the water after the river comes up, yes, sir. I couldn't say how far back that goes. It went back through a part of that land. As to why it didn't go back through all of it, it was because the river didn't stay up long enough. If the river had stayed up long enough, as to whether it would have gone back through it (objection), I will answer, why, yes. sir, if it had stayed up long enough. Yes,

6414 there was some gumbo or clayey deposits under there to prevent the water from getting back. I can't say that it didn't sub-irrigate, but I don't think it ever did to amount to anything. As to how much of that land down near the river had gumbo or clayey substance under it (objection), I never turned the land

6415 over to see how much gumbo it had under it. As to whether there was gumbo under some it, I don't know. I cultivated that land two years—in the years 1880 and 1881. I don't know whether they were extra wet years or not. I think we had pretty fair seasons. In 1880 it was dry in the fall. In the fall of 1880 or 1881, one or the other, I am not certain which it was, the river went slap smack dry. It was a dry fall. I happened to raise a corn crop, because I had rain in time to make corn. I don't think the presence of the river affected the crop at all, not a bit in the

6416 world, in either year. I don't think it affected any of it more than just a few rods out, perhaps. As to whether I think there is such a thing as an underflow (objection), I will answer, yes, sir, I believe there is an underflow all over this country. As to how far back it extends, well, I have never been anywhere yet in this neighborhood but what I could dig or bore down and strike water. As to whether the level of that underflow varies, that is something I couldn't tell you. As to whether it is higher at one time of the year than at another, I don't know anything about that. The only reason I think there is an underflow here is that by digging down you always find water if you go deep enough. That is it exactly. I don't know about my observation not being very extensive in this valley.

No, I never heard anybody talking about this suit before it was brought. (Objection.) I don't know of any of the farmers

6417 from up the valley having any meetings here in the city of Wichita before this suit was brought, to discuss the

matter. I never heard of it. I read the "Wichita Eagle" very little. No, I didn't read in the "Eagle" anything about it. No, I never read any discussions in the "Eagle" or anything about it, not until after the suit was commenced. As to what the conditions of other farmers are in the different parts of the valley or whether they are injured, (objection), I don't think there have any of them been injured, myself. I don't know it if they have. As to why I think they have not been injured (objection), why, I
6418 just go by what I see. I don't see that anybody has been injured. If witnesses have testified that they were injured (objection), I think people get mistaken. I don't profess to know what the conditions of the lands in other parts of this valley are, outside of where I am well acquainted. Yes, they might have been injured and I not know anything about it. No, sir, I don't pretend to know the quality of the soil all through the Arkansas
6419 valley in Sedgwick county. As to why people do or do not raise good crops in other parts of the Arkansas valley, I
6420 will say, no, I don't know why they don't. As to whether they have been injured or not (objection), I don't know anything about that. Yes, when I said that I thought they were not injured (objection), I had reference to my neighbors right close home that I was acquainted with. I usually go to Wichita once a week, and then I go around once in a while and see the river at other places. I am not sure how the river was in the fall of 1903, but I think it was dry. I think I have seen the river dry many a time—several times. I am not sure, though, that I saw it dry in 1903. I
6421 think it was dry in the fall of 1902. I am not sure about 1901. I am not certain about 1900. I am not sure about 1899, nor 1898, nor 1897. During the last seven years I have lived seven miles from the river and have had no occasion to see it during the last seven years like I had during the years after I first
6422 came here. As to how I compare the flow of the last seven years with the flow of the first seven years, well, it is like this: Four years ago I remember the river breaking—cutting over the banks and coming down the slough. No, there was no rain here. There was a flood in the river. And the river got out of its banks and came down across the slough, and we didn't have any corn that year. I can't tell the dates of these things. I forget these things unless I have something to jog it in my memory. The reason I can't tell the condition of the river from 1896 to 1903 is, we thought nothing about the river. Of course it was dry a good share of the time, and a good share of the time it had water in it.
6423 I think the banks are not as wide as they used to be. Yes, there are as many islands as there used to be, and I think they have enlarged and grown up to trees during the last ten years. As to Ackerman's island down at the city of Wichita, I don't know anything about it. The island I saw just above the Douglas avenue bridge has been getting larger than it was in the earlier years, and it now extends clear under the bridge. I am not sure about it ex-

tending thirty or thirty-five feet below. I think that island became covered with trees something like ten or twelve years ago, and that is true of the islands up the river, so far as I know, yes, sir. As to the carrying capacity of the river being as great as it used to
6424 be, I will say I don't think it is, and this is because of the narrowing of the banks and the river becoming filled up with islands, yes, sir.

6425 J. M. HALL, Wichita, Kansas.

Direct examination.

By Mr. GREGG:

I am sixty-four years of age, a farmer, and live at Sedgwick, Kansas. I have been farming thirty-five years this last spring. I own 320 acres of land in Greeley township, in this county. That is about thirty miles northwest of Wichita, near the Arkansas river. The Arkansas river runs within about forty rods of my land. We call it bottom land. Yes, sir, I have some lands in other parts of the State. I own 400 acres in Kingman county. (Objection.)
6426 Yes, sir, I have been farming this 320 acres of land on the Arkansas river ever since 1870, excepting 1879 to 1889. Yes, sir, the river is in full view of my house. I can see the bed of the river from my land. Yes, sir, I have been living there continuously since 1889. Yes, I was frequently upon the Arkansas river
6427 during those earlier years and also during the later years. As to the flow of the Arkansas river near my land during the nine years from 1870 to 1879 as compared with the nine years last past (objection), I would say my opinion is that we have had a stronger flow for the last nine years. By that I mean the river has not been dry so often in the last nine years as it was from 1870 to 1879. I am excluding floods in the river, yes, sir.

Yes, sir, I have heard the underflow or first sheet water, so-called, in this country, spoken of. As to my having had experience in sinking wells on my land, I would say I have never experimented to find out just the depth we had to go. I have used altogether drove wells, with the exception of the first year I was there. That was a dug well, where I first located, and I sank a barrel. At that time I didn't go to exceed six feet for first water, and that
6428 was nearly a mile from the bank of the Arkansas river. Yes, sir, I put down drove wells since that time from year to year. As to whether in putting down those wells I could tell about the depth of the water, I would say, nearly always. Yes, sir, we put those down from year to year and changed them from place to place during many of the years I have been there, and in driving those wells at the different times I have not noticed any material variation in the depth at which we struck the water. I noticed no difference.

Yes, I am pretty well acquainted with the farmers up and down the river where I live, especially with the old settlers. There are a good many new ones there that I don't know. As to my ever having heard any of those farmers complain to the effect that their crops are or have been injured by the lowering of the water level or the underflow, I have not, and I have never heard any of them complain to the effect that their land has been damaged or made less valuable by the lowering or falling of the underflow.

6429 I raise principally corn, wheat, oats and rye, and as to how those crops compare now with the crops in the earlier years on the same land, taking it acre for acre, I think they compare very favorably. There are some pieces of land that are getting a little worn and thin, but as a general thing the crops on them are equally as good as they were at an earlier stage. And what is true of the lands I have just spoken of was true of the lands adjoining me in my vicinity. (Objection.) As to the values of lands along the river there for the last twenty years as compared with past years, I would say they have almost doubled in the last ten years. As to the average value of farm lands like mine through that part

6430 of the country, bordering upon the Arkansas river, per acre, I should say they are worth about $40 an acre for an improved farm. No, sir, I don't think they have ever been higher in value than that. I think the present value is the highest they have ever attained.

Cross-examination.

By Mr. ASHBAUGH:

I live about a mile from the river. Bentley is my nearest town, and that is five miles away. I live west and north of Bentley. No, sir, the river is not as wide as it used to be. (Objection.) There are some islands in the river there. They were there when I came. (Objection.) Yes, there are trees on them, and there were trees on them in 1870—cottonwood trees. The islands I think are about the same size now that they were then. I think there is a greater number of islands in the river than there used to be. No, I

6431 am not familiar with the river from Hutchinson to Wichita. I am familiar with the river from near Bentley to Mount Hope. As to what caused the river to narrow, my opinion is that by keeping out the fires and preventing the burning of the growth of vegetation the trees and grass have been allowed to grow up stronger and it has naturally narrowed the channel. That is my opinion. I can't remember how the flow of the river was in the fall of 1903, nor 1902, nor 1901, nor 1900. I couldn't say how the flow of the river has been for the last five years of the '90's

6432 in the fall of the year. In 1904 it continued to flow along through that country pretty strongly for the season of the year. I believe that 1895 had more water flowing in the river than 1904. There was a larger column of water. I should think the

carrying capacity of the river was as great in 1895 as it was in 1904. My impression is that the channel of the river has narrowed and also deepened. I don't know that the whole channel has deepened. Yes, I believe that the carrying capacity of the river, with the water at the same height on the banks, is as great now as it was thirty years ago. Yes, sir, it is narrower, and has got to be
6433 deeper. No, sir, I haven't seen the river from the mouth of the Little river up to Bentley in the last five years, not all the way. I have seen places in it. There are some islands. No, sir, I don't know where Swan's island is. I have been in Hutchinson within the last five years, and went by rail over the Missouri Pacific. I don't remember that I located down the river when we crossed the bridge below Hutchinson, and have no recollection of seeing how the river looked from the Missouri Pacific bridge within the last five years.

Yes, sir, we are troubled with drouths up here. When the
6434 rains are not plentiful but the river is full I don't believe we have more rain than though the river was dry. I can't say that the lands along there are moister or better sub-irrigated when the river is full than when it is empty or dry. I can't say that it affects it at all. No, sir, I haven't seen any results of the underflow in that way. I have never noticed that the depth of the water rises and falls according to the condition of the river. I have had two open wells. One of them was kept open about a year and the other practically two years. That covered 1870 and 1873. Since 1873 at times I have been able to see where the water level was on my land. Two years ago this summer I dug a pit in my yard to get some sand. It was a very wet time and the ground was full of water, and I struck the water at six feet. Then I left that pit open for perhaps a month or more and when it quit raining and set in dry I noticed that water settled there about a foot deep. I could go a foot farther and get dry sand. I don't think the river influenced
6435 that at all. I think I kept it open about a month. That was in June. That is usually the wet month. No, sir, I have no means of knowing what the water level was in November. I couldn't say whether the water level rises or falls under my land. The only way to tell from a drive well would be to take the pump off and drop something in. You can't tell by seeing it nor by pumping the water. Yes, sir, we always drive those wells down until we get a good supply of water anyway, whether that be one or two or three or four feet. Yes, sir, we are affected by drouths here, and we are affected by floods. Yes, sir, the less drouth and the less
6436 flood we have here the better for the farmers. Yes, sir, if this suit should result in decreasing both the drouth and the floods it would be better for the farmers of Sedgwick county. Our crops would be better on the average, I think, and would be better every year. Yes, we would be more certain of crops if the drouthy season could be reduced. (Objection.) If the carrying capacity of

the river has decreased, I think we would be more subject to
6437 floods. (Objection.) Yes, if the result of this suit should be to keep a sufficient flow in the river and to keep the river channel washed out and to impound the flood waters in the State of Colorado so as to decrease the floods, I think it would be very beneficial. (Objection.)

I have an idea of what the farmers in our part of the county mean by the underflow. No, I haven't found out that it affects their lands. I haven't heard any complaint in that direction. (Objection.) No, I don't know of any of the farmers discussing this
6438 matter before this suit was brought. I might have heard about their holding meetings in Wichita, but I have no recollection of it. I think perhaps I may have seen something of that kind in the "Wichita Eagle." I don't know that my land is not affected by the underflow. (Objection.) No, sir, my land has not raised a better quality of grass in the last few years than it
6439 used to. It raises more weeds now than it used to. It seems as though it is harder to keep them down. I don't know that there is any more moisture under the land than there used to be. It might possibly be that other lands were affected by the condition of the river and my land not affected in that way. (Objection.) Some land is a good deal lower than others. There is some land near the river that is more sandy than my land. If it was a good deal lower it would be more subject to overflow, yes, sir. If the river is getting narrower from year to year these overflows and floods might increase in injury and destructiveness, yes, sir. (Objection.) 1874 was a very dry
6440 year. I remember that by raising nothing, and the grasshoppers ate up what we did have. They came on the 6th day of August. No, sir, it was not a good year before that. It was dry after the middle of June. No, sir, I don't remember the year 1879. In the years between 1874 and 1880 we had an excess of moisture. As to how I judged of the flow of the river in my answers to counsel (objection), I will say I judged by the height
6441 of the water in the river, of course, yes, and the place where it flows out from the river. I am about ten miles from the Little river. I couldn't say whether the bed of the Little river is above or below the bed of the Arkansas river at right angles from the Arkansas river. It is farther to water directly east of my place on the Little river. (Objection.) The land may be higher. The banks of the Little Arkansas river east of my place are much higher than the banks of the Big Arkansas river. We never had a
6442 year but what we had rains sufficient to raise some corn. I raised some corn in 1874, but some of my neighbors didn't. They planted it early and it was a little too hard for the grasshoppers to eat, and that is the best seed corn I could get. I never knew of an entire failure in the corn crop. I have known of a good many years when there was not sufficient rain to mature a good crop.

6443 The valley here is ten or twelve miles wide. I think on the uplands they had an entire failure of the corn crop in 1874. In ordinary seasons the corn is better on the uplands than on the bottom lands. The bottom lands are not always, then, the best corn lands. In some years they are; that is, in the dry years. I think it is a sandy soil and will retain the moisture better. During those years they probably get it from below, and proba-
6444 bly get it from above. I think they do sometimes *do* get a portion of it from below.

Yes, if the carrying capacity of the river was lessened, of course it would follow from the way the question was put that the river would overflow more, but I don't believe that the carrying capacity of the river is any less, because where the river channel is narrowed I believe it has plowed out more and made a deeper channel in the river, so that it is my opinion it has about equalized the matter. I am satisfied that it is deeper by observing in crossing it. I think it has been deeper for the last ten years. I never saw the river higher than it was in 1895.

6446 JOHN WILLIAMS, Wichita, Kansas.

Direct examination.

By Mr. DAWSON:

I live in Eagle township, and we call it twenty-five miles from the city of Wichita. My residence is a mile and a quarter from the Arkansas river, but my land runs down to it. I have as much as five miles of frontage on the river anyway. I have right in the neighborhood of or something over 3,000 acres of land in that vicinity and 800 acres in Reno county. I believe we live about half way between here and Hutchinson, on the river. I moved my family there thirty-two years ago last month, and I have been living there ever since, farming and stock raising. In handling my stock and going over my lands I have had opportunity to see the Arkansas river from day to day and from week to week.
4647 In the last thirty-two years I was at it very frequently. Sometimes every day and sometimes it may be a week, probably. I wouldn't say every day. But I have been pretty constantly right there.

As to the average flow of the Arkansas river in the vicinity of my lands compared for the last ten years with an equal period of time in the earlier years, I would say (objection) there hasn't been much difference to me. If there is a difference I haven't noticed it much. If anything we had more dry beds years ago than we have had the last ten years. Yes, sir, my judgment as to the flow is based upon my observation extending over this period of time. I have had chances to know something of that. I have put
6448 down a number of wells in different places. (Objection.) I go, I should judge, from four to eight feet to water, on the

average, on my land. Taking it for the average time since I have been there, I would say the general level of the ground water, the first water under the ground, is about the same. No, sir, I couldn't say that there is any difference, really.

As to the effect the farming of land for many years has upon its productiveness, I would say, of course it wears land some to continually crop it, and in all new countries the land is not taken the best care of. But take new land now, it would be as good as new land was in those days. As to my own land and as to the effect of constant cropping and the lack of fertilization on it, I would
6449 have to consider that it does deteriorate some. Making allowance for the natural running down of the land from constant cropping, as to the productiveness of the land in late years compared with that of earlier years, I would say there has nothing unnatural occurred, not to me. Nothing unnatural.

As to the values of land in my locality at the present time and as to how they have been for the last two or three years compared with what they were at earlier times, I would say the land is considered worth more. The places are held higher, and if there is a place sold it has brought more money than it used to.

Cross-examination.

By Mr. ASHBAUGH:

Yes, sir, my land extends five miles along the river and a mile and three-quarters, at the farthest, back from the river. Along the river if you will go where there is a kind of low place you will strike water quicker than where there is a high place. It is not level entirely. There are little knolls and low places. In the low places I should say you would go about four feet to water. Yes, sir, I have my hay land along there. I think we had the largest crop of hay last year that we ever had, about like it was probably the ten years previous to that, with the exception that I don't think—take it thirteen years ago this coming crop, it was the lightest we had had for several years. The dry weather made it light.
6450 The river was dry some of the time and some of the time it was full. That was in 1893, I believe. When the river is full of water, as to whether the water is nearer the surface of my land than when the river is dry, I will say, yes. When it gets up to its bank, you know it is a gravelly bottom and it follows under. Some of my land underflows. A good deal of it overflowed last year; I couldn't tell how many acres, but quite a little of it. It didn't overflow from the river last year, but the river was out at the time we had the heavy rains, and it was the heavy rains that caused the flood—that is, that made the water on the lands. It didn't run out of the river, but it didn't let the water into the river off
6451 the land. I suppose last year there would be water covering several hundred acres of my land, perhaps a third of it, and it stayed more or less there for some three weeks. Not as long as

the river stayed up. The river had run down or the water wouldn't have gotten away. Yes, that land will overflow when there is a very large flood in the river although there are no rains here. Some of it has overflowed within the last three weeks. Not very many acres, but say probably forty acres.

There is some made land along the river at my place. I couldn't tell how much, but it has made in places and in places
6452 washed away. No, I don't believe the river along my land is as wide as it used to be between the banks. Yes, there are islands; there always was since I have been there. I couldn't say they have increased in size. There is more vegetation on them, I think, and they seem to be—of course my mind sees and my eyes imagine that the river is deeper now than it used to be. I believe it is so now. I wouldn't consider a great deal of it deeper, and some, of course, where they talk about it being made, that is higher now; but when the river is up it covers that land. No, sir, I did nothing to make that land. I am too lazy. If I hadn't been too lazy I would let the river take care of itself. Yes, sir, for all I know this made land was purely by the action of the river; and this condition is up and down the river as far as I know; that is, I haven't seen anything to the contrary. I don't know how many more acres there are of my land now than there was thirty years ago. I couldn't begin to say anything like the number of acres.
6453 There may be a hundred acres scattered all the way up and down. I don't know. There may not be that. I wouldn't say. But not in one place or anything like that. There are little places that have grown up, as it were, and some of it taken away. This flood now has taken quite a piece of the fence away. As to the river being narrower than it was thirty years ago, it is not narrower when the river is up, because it covers all the ground it did then. As to its natural and normal flow outside of any flood period, it is about the same. I don't know that I can recollect how the river was in the fall of 1903. Coming to think of it, it was low, to the best of my recollection, for quite a little while. It was dry in the fore part of the summer, in May, I believe, and then we got a long drouthy spell and then the river wasn't high any more thatI recollect of. During that dry spell my land was very dry.
6454 The crops were cut very short. But there was ten weeks there was no rain with us, and the river was low, to the best of my recollection. If there had been no rain but the river had been high, we would have poor crops. I can't believe that our land would have any more moisture from the river. That is my honest and candid opinion. I don't think the underflow comes back under my land to help the crops. It must follow the gravel. Reason tells me that. But that doesn't help the crops, though. If we drive a pipe down we know when we find the water, and we always do when we drive a pipe. You can tell when there is water
6455 comes into the pipe. We most always carry something along to test the depth to the water before we quit driving so as to

know how much water we have got. As to there being a difference in the water level at different times of the year, one time when the river was up and another time when it was down, I would say I would naturally suppose there would be a difference. I have never observed that. I have seen the river up very high when we were suffering for rain and it didn't help us. I have noticed that. But the water will follow that gravel, I believe that, wherever the gravel bed is, as it rises in the river. If there is more water under my land, as to whether I think it injures my crops, I would say, no, it has no effect on them. It is the top or surface waters that injure the crops, always. If the water is within four feet of the surface under my land, as to whether there is any better crop than when it is seven feet to water, I can't think that there is from observa-
6456 tion of my crop. If the water was within two feet of the surface, as to whether it would be better for my land than though the water was within ten feet from the surface, yes, sir, it may be probable, but then I don't know that it is. It is the rain. That is what we go by, and not the river at all. As to those low places where the water is within two feet of the surface, we don't calculate to cultivate those low places where the water is so near the surface; that is, in some kind of a low hollow. As to whether corn grows as well on the uplands as it does in the bottoms, I have seen corn that way. It depends more, now, mind you, on the soil it is in. Well, that is what I have been studying now, whether the soil is the same, whether I know of any soil on bottom lands just like there is on the uplands, but I would say now if the soil is the same I would
6457 say it would be about the same. In our country there is not very much difference in the land between the uplands and the bottom. I can tell you this, now,—and what I tell you is true in regard to that, because it is something I know what I am talking about,—there is soil on the highest land I have got that will stand the moisture just as well as it will in the bottom. We call that second bottom. There we would go about ten feet to strike water. Not right there I don't think that the water rises or falls at different times of the year. Yes, the water level under my land does rise and fall. You take it down in the bottom and when we have lots of rain it is a little higher. I know of two instances where we have had well pipes down. Both of them are pretty well right in the bottom, and there was a while when the water would run over the top of the pipe, and as the rain and the water dried up that stopped. The condition of the river then was as usual.
6458 No, I don't pay any attention to the river. When there is a flood in it I can't help it and it don't bother me any. If a flood runs over the land it hurts the grass. If the river keeps narrowing and the same amount of water comes down in the river, as to whether I would be bettered or injured, I would say it wouldn't make any difference to me. No, sir, it would not flood my land any more now than it ever did. Yes, sir, I was there in 1877 and remember the flood of that year. I have

had a worse flood than that, really. The worst flood we have had was, I believe, eight years ago this coming July. That flood came from Colorado, I suppose. It didn't come from local rains, that is, around us. We had no local rains at that time. If the river
6459 banks had been higher and there were no islands in the river and no obstructions in the river, as to whether I would have been injured so much by that flood as I was, I will answer, yes, that is just what I was telling you. I don't think that has changed matters any, because I claim we have as much flood coming down now as we used to, with the exception of that time. We heard there was some dams bursted up there west of us that caused that flood, but I don't know whether that is true or not, but with the exception of that time we have nearly the same floods we used to have. As to whether I judge of the amount of water in the river by the flood season or the lower water after the floods have passed, I would say, well, about the same. After the floods have passed I must say it is my true conviction that the low water now is about equal to what it used to be. I don't know where it comes from. It comes down the river; that is all I know. As to the condition of the river from August, 1903, to May, 1904, I will say we had a dry year. The river was dry two or three years. I am not really certain about which years it was. It will be four years this May that I had reference to that we had a wet spring. April was very wet and
6460 we had a dry May. In that year the river became dry. As to whether the river bed filled up about eighteen months ago and then washed out, I don't recollect.

Redirect examination.

By Mr. DAWSON:

As to whether the river at my place was dry between August, 1903, and May, 1904,—that would be about nine months,—I would say I don't recollect it. Yes, I think if the river had been dry that long and there was no running stream in it for nine months at my place I would have remembered it. I think I would. (Objection.) As to what I depend on on my land to make the crops, I would say rain and work, and if it don't rain we don't get any crop as a general thing. We don't get anything worth calling a crop.

6461 J. R. SITES, Wichita, Kansas.

Direct examination.

By Mr. MELVILLE:

I have lived in this county since the 20th of April, 1884. I am sixty-two years old. I have lived near the bank of the Arkansas river continuously since I came here. I lived about eight miles northwest of the corner of Douglas and Main streets, up the big

river, and I lived at that particular place eight years. My land there has a frontage on the river of 160 rods. I lived on the west bank of the river, and at the house where I lived it was on
6462 the rise. We got water in about fourteen feet there, but over near the river where it was not on a hill we got water at from four to eight feet. Yes, sir, I am speaking of getting surface or ground water—the first water. I raised corn and oats—mostly corn—on that land, during the eight years I lived there.

As to the continuous flow of water in the river during the time I lived there as compared with the last eight years, I would say there has been a greater flow of water in the river during the last eight years than there was the eight years I lived there. Yes, sir, during the first eight years I lived there there were times when there was no running water in the Arkansas river. I think the first time the river went entirely dry was during the fall of 1885—and by its being entirely dry I mean it ceased to flow. A man could cross right over the river without having any water to step over at all. Yes, sir, during this season I raised some corn. As to the amount of rainfall and the distribution of it during that particular year of
6463 1885, I would say there was not so dreadfully much rainfall during the year 1885, and the crop of corn wasn't as good as in the year 1884, although I raised a fair corn crop in 1885. 1884 was the best year for rainfall I had in Kansas. I had 120 acres of corn in that year that averaged me 70 bushels to the acre. That was the first year I was here, but during that year we had a rainfall every week during the summer. Yes, sir, I raised corn during the year 1888 on this same piece of land of which I am speaking, but there wasn't nearly so much corn as in the preceding year. There wasn't so much rainfall that year, I don't think. Oh, there wasn't so much rainfall, and the corn crop, while it was fair, was not so good in this year. Well, I don't remember in which of the years 1886 and 1885 I raised the heaviest crop, but neither was nearly as good as the 1884 crop. Yes, sir, I raised corn on this place during the years 1888 and 1889 and every year I lived there I raised
6464 corn. As to whether during any of those eight years I lived there and raised corn the river was full or had a good flow of water in it, in which there was not a good distribution of rainfall, I would say, yes, sir. There were some years the river had more water than in others when there was not so much rain.

Q. And were there years when there was a good distribution of the rainfall and no water in the river to speak of?

A. Yes, there were years when there was more rain than there were others when the river was full.

As to the quantity of the corn crop raised in the years when there was water in the river and no rainfall, compared with the years when there was a fair rainfall and no water in the river, I would say the corn crop was always the best when we had a rainfall. As to whether during the eight years I lived on this farm I ever raised a crop of corn when the river was full or approxi-

mately full and there was no rain, I would say we never had a good crop under those circumstances. We always raised some corn, but if there was water in the river and no rain we raised but little corn.

As to my having had experience with other farm or garden products along the river in these eight years, I would say, oh, yes, we raised a variety of stuff. We raised sometimes oats, but mostly corn. And as to whether during these years we depended
6465 upon the rainfall or on the amount of water in the river, I would say altogether upon the rainfall.

I lived about twelve years in the city of Wichita following these first years I was here, northeast about a mile and a half from the center of the city, upon the west bank of the Big river, and I conducted a gardening farm there. During those twelve years I was there and the eight years I was on the other place I saw the river every day in my life. Taking the period of time following the eight years and the twelve years, to the present time, I would say I have pretty nearly seen the river every day since I have been about Wichita. I have either crossed it or have been after something or other that I have seen the river, until within the last year I haven't seen it every day because I have been confined at home a good deal. I haven't been able to be in town much.

Yes, sir, I have heard concerning the so-called underflow in this country, and I have been familiar with the conditions of the land along the river known as the first and second bottom lands
6466 during this period. As to the effect of the underflow upon the crops, and particularly upon the corn crops, I would say that I think so far as the underflow is concerned it has no effect at all upon the crops, whether it is high or low. I think not. As to how far back the underflow affects the lands, and what particular lands on the river, I will say, outside of the sloughs along the river and the very low land I don't think it affects crops at all. It is my experience that it don't. Now, as my reason, I will give one instance of one of the years I gardened on the Arkansas river. It was very dry and hot along about the month of June when the Colorado floods came down and the river was as high as I had ever seen it. I was farming some land that I had rented that came right up to the river bank. It had a frontage of about 500 feet, I should judge, on the river bank, or 300 feet, probably. The garden came right up. There was just room to turn a horse around between the garden and the river. The river lacked about a foot and a half of coming into the garden. There was one place where it was a little low that by digging about a feet deep I irrigated a place about as big as this court room, not less than that; notwithanding that the river was so high that the balance of the garden was suffering just as much as it ever did when the river was low.

6467 As to whether I ever had any experience with new land or what is commonly called virgin soil, and with land that has been cropped for a number of years, I would say, yes, sir. As to whether in my judgment land deteriorates or improves with con-

stant cropping (objection), yes, sir, every man knows that land that is continually cropped, the crops take the nutriment out of the ground to a certain extent and it deteriorates from year to year unless it is kept up by fertilization of some kind. Taking into consideration this deterioration of the soil, as to the possibility of raising as good crops, and particularly corn, in the last five years as compared with the first five years I was in this country, I would say it would have to be under very favorable circumstances—more favorable than it was when the land was new, if you raise as good a crop after the land has been farmed a great number of years. Taking into consideration the natural deterioration of the soil of which I spoke, upon the same land, as to the possibility of raising as good crops, including corn, in the last five years as compared with the first five years I was in the country, I would say they are fully as good.

Cross-examination.

By Mr. ASHBAUGH:

6468 Yes, sir, this garden I spoke of irrigating a little of was about a rod from the river. I dug a ditch into the river a little and let the surface water run in. There was a low place in the garden, and by digging about four or five feet through a bank there it let a little water into a place about as big as this court room. I think the garden was about two feet above the river water as it then was. The garden was a sandy loam, and it didn't become saturated with the water from the river. I came here with a distinct belief that I could raise a crop from the underflow alone, but I have gotten over that years ago from my experience. There is an underflow, but it has no effect upon crops unless we have
6469 surface rains. The underflow is near the river. I don't think it affects the ground very far back from the river. If the underflow is within fifteen inches or two feet or three feet of the surface, as to its having any effect upon the corn crop, I don't believe it has any distance from the river. It might have right at the bank, within a rod or two. Oh, yes, if the underflow was within fifteen inches or two feet of the surface of the soil it would affect the crop if that is true, but that is not true. In this country it never comes within two feet of the top without surface rains. I think I know the conditions all up and down the valley from here to Larned. I have been here for twenty-one years and have paid attention to these things. No, I haven't observed the underflow as far up as Larned. I haven't been out of this county. I have not observed it in
6470 Reno county. I have not been up that way. The flow of the river was not as great ten years prior to last year as it has been in the last ten years. Yes, I know Lane's island, and I have lived right by it. Yes, sir, I remember the law suit in the district court of Sedgwick county begun in the year 1894 in which that island was brought into consideration. I sat by and heard it. I

know that a jury found in that case that the Arkansas river was a navigable stream. I don't remember who was on the jury. Yes, they decided it was a navigable stream and gave the land to Lane. I understand so, and also in a case since that, in a case I was engaged in at one time, that of Mr. Swan up here, the negro, where the adjacent land owners were trying to take his land from
6471 him, and the jury decided the same thing in that case. As to the river not being navigable here for the last few years, it never was navigable only in theory, for flat-boats. It was just as navigable the last few years as it was before that.

As to the flow of the river in the fall of 1903, I don't remember just the years. I couldn't give the dates exactly. There was one time along about that when there was no water in the river for a long time. The dry spells come sometimes in July. I couldn't give the years. I am a poor hand to remember dates. As to there being no water above the mouth of the Little river from August, 1903, to May, 1904, there never was a time when there was no water in the river that long since I have lived here. As to how the flow of the river was in the winter of 1903-'4, in the early part of the winter there was no water in the river, but along towards spring the river had a small stream in it. In September, October and November, 1903, if that was the year, it was dry, but I couldn't say positively it was 1903. I think there was a small stream
6472 in 1902. I kind of think it was dry in 1901. It would be in the fall. I couldn't say about 1900. I couldn't give the exact dates. I know there were a good many years before 1890 it was dry. During the years from 1895 to 1900 I think that most of the years there was a little flowing water in it, just a little amount. It was not very high. Yes, I think the river was dry in 1885. We had a flood in June. I remember it was bank full. I am not very much familiar with the cellars in the city of Wichita. As to
6473 whether cellars in the city of Wichita had water in them for a number of days or weeks in July, 1904, that never were wet before, I will answer, I couldn't say about that. I don't know. That is a matter I gave no attention to. As to whether I saw anybody pump any water out of any cellar here last July after the flood, I will say, well, it seems to me I did, but I don't remember what year it was. As to whether most people had to pump water out of the cellars in the city of Wichita last July, I will say, I don't think it came from the river. I think it came from the heavy rains off northeast here that came down off the hill. I think it did flow in from the surface, from the ground being wet by the surface rains, because I know the whole streets were flooded. That certainly didn't come from the river. It washed the sidewalks away and crossings. No, it didn't come from the river; it came from the heavy rains. I don't know that I noticed any open cellars that were in process of building that had water come into them from below after the
6474 flood a year ago. As to how familiar I am with the city of Wichita, I will say, oh, I have been here most every day for

the last ten years, but these are matters I paid no attention to. I was at my office. As to whether there was water in nearly every cellar on North Lawrence avenue where the water didn't flow in from the surface, I couldn't say a word about that; because there isn't a place in town I hardly ever was at. I lived on North Lawrence avenue, No. 206, during the years 1901 and 1902, and it didn't come into my cellar. I don't know Mr. Darling of this city. Yes, sir, I have heard of him, but I don't know him. I don't know where he lives. Yes, sir, I know where the corner of 12th and Lawrence is, but I am not familiar with it. I know the location. I don't know that that was not in the flooded district. I was not there to see. There were no cellars that I know of in my neighborhood that had water come in from beneath. I couldn't tell you whether there was water in the cellar of the Sedgwick block in this city. I couldn't tell you whether that was flooded there. Yes, sir, I knew the old court house in the city at the corner of First and Main streets. It has got a b-sement under it, yes, sir. I don't know why they didn't
6475 build a cellar there. The Sedgwick block is on the east corner of the square, on First street, and the old court house is on the west corner of the block. There is just an alley between them. The court house was built there when I came here and the Sedgwick block was built since—I think about 1888. It was during the boom. As to why there was no cellar dug under the old court house and why there was a cellar dug under the Sedgwick block, I don't know anything about that.

If the roots of my vegetables in my garden went down into moist ground from the underflow, as to whether it would affect them at all, I will say that I think if they went down into it, it probably would. If corn roots should go down into moist ground, made moist from sub-irrigation, as to whether that would have any affect on the corn, I would say, I don't think it would have any affect upon the corn, for corn is a grain that if it don't get rain when it is producing pollen to fertilize the silk and produce corn, it will not make much corn anyway, although the roots might go into the water. It would not produce pollen.

Redirect examination.

By Mr. MELVILLE:

6476 Yes, sir, at certain places it is possible that the land would be sub-irrigated from the river at certain times. Yes, sir, I am familiar with the formation of the lands along the river in this county. As to there being any difference in the soils in the way of certain portions of the land having what we call a hardpan or gumbo underlaid at certain distances and lands that are entirely sandy and porous, I would say, oh, yes, and I should think that the amount of such lands is pretty nearly divided. I should think one-half of the land along the river is underland with hardpan or gumbo, especially in the low places.

6477 SIMON H. LOUGHLIN, Wichita, Kansas.

Direct examination.

By Mr. DAWSON:

I live about eighteen miles up the river from here, and about a hundred yards from the Arkansas river. I have lived there since the 12th of February, a year ago, and I have lived in that locality since 1872. That is the year I was born, so I was raised in the Arkansas valley. As to how far back I have a definite recollection of the river, I should say that I couldn't remember anything very definitely until along about 1882 or 1883. Not very much until after I was ten years old.

As to my having had an opportunity to see the river from week to week pretty generally from 1885 to the present time (objection),

6478 I would say in the summer time we generally went swimming most every week. In the winter time if it was any good we would go skating. I would see the river quite often. And during the last ten years I have had an opportunity to see it the greater part of the time, as I have been working so that I could see the river from the field. I have been farming mostly, and we have a hundred acres up there along the river.

As to the average flow of the river for the last ten years compared with the average flow of the river in the same locality for the ten years preceding, according to my observation I would say I don't believe there is any perceptible change.

As to the kind of land upon which we have worked for the last twenty years, being bottom or upland, part of it is what is called second bottom and part of it is first bottom land. Yes, sir, at all times for the last fifteen years our land has come up to the river.

6479 As to our having sunk any wells at different times on this land, I would say not any open wells. We put down drove wells. When we would put down a drive well, as to there being any way of ascertaining when we reached water, I would say, yes, sir, but then you don't get the water in a drove well from the first sheet water, but you generally take an auger and bore down through the clay to the first water sand and then from there on drive the point. As to the general level of the ground water on the first and second bottoms in my locality now as compared with fifteen or twenty years ago, so far as my observation goes, I would say that on the first bottom I don't think there has been any change in the water level to speak of at all, if there has been any.

As to the effect upon land to have it continued in the same crops, any one crop takes certain particles to nutrify or build up that plant and the ground contains only a certain amount of it, and if you don't put something on there that produces that you will finally use

6480 it all up and your crop will not produce. There is a running down or deterioration of farm lands in the locality where I live, and there is in all of it. Aside from the deterioration

naturally incident to farming land, as to its productiveness now compared with what it was fifteen years ago, I would say I have noticed this, that after breaking the land up and farming it until the crops begin to get poor they will change and rotate the crops, putting in alfalfa or something of the sort, so that their crops will be practically as good as they were when the land was first broken, and if they don't do that they are poor.

As to whether our crops depend upon moisture from the river or upon rainfall, I would say in the first bottom you can't get along without any rainfall at all if the ground is sandy, and if the ground is gumbo you have to have rain. As to how far back I have noticed the influence of the river upon crops to any appreciable extent, I would say I have never noticed it anywhere over a mile. As to the average distance, not taking out the low places that run back farther into the land than the average, it will affect it back until the first running surface water, and then after that it doesn't have
6481 any perceptible effect at all. As to getting any real results from the underflow for the corn crop without a seasonable rain (objection), I would say, on sandy land you can; on gumbo or something that is impenetrable to the water below you can't. I mean in sandy land in the first bottom.

Cross examination.

By Mr. ASHBAUGH:

As to the water level under the first bottom lands fluctuating between a time when the river is high and another time when the river is low, I will say, it does. In answering the question by counsel as to there being no change of the water level on the first bottoms, I meant to say, as I understood counsel, that—he asked me if for a period of years, averaging a general level of the water, there had been any change in the general level, not in the fluctuation, and I answered that I didn't think there was in the first bottoms, but I think there is a fluctuation in the time as to whether
6482 the water is up or down. As to whether there is a change of this water level between these two different periods on the second bottom, I will say I never knew of any. As to how much the water level will vary in the first bottoms, I will say, I should judge at different times, owing to whether you are close to the river or far away from it, it will vary from two and a half feet, probably,—well, commencing at the bottom at a foot and a half to two and a half feet. If you have sandy soil the fluctuation is greater than if you have a hardpan or solid soil. As to whether there are some places and spots where there is a hardpan that the water cannot penetrate, I will say I will put it with this exception—if there are no crawfish holes through it. If there are it will come up through those holes. But that will

be very limited, yes, sir, and as to those places in general
6483 there would be no rise of the water in those places. If on some pieces of land parties might not notice the change in the water level at all and in other pieces of land near there but with these different conditions a change in the water level might be noticed, I will say, yes, sir, and it might be a very small place too. I have seen places no larger than this Federal building in the field that wouldn't be affected at all by the rising of the water, while all around them there would be good crops, and no rain. That would be noticed in a dry year usually; that is, a dry year from lack of rainfall. Yes, in Sedgwick county if we have plenty of rain and it is seasonable we can raise a crop anyway. If there is a dry year from lack of rainfall, then as to how the crops are on the first bottom, I will say, you go on the first bottoms and if it is too wet from the river or from rain, either one, you can't raise crops, and there is such land. It depends, as to being limited or otherwise, on whether the land is on a higher level than the river a great deal, and
6484 if you get too much moisture on it it kills the corn, even if the moisture comes entirely from the underflow. If the land is not too wet. Now, if this first bottom land is not too wet, and in a dry season so far as rainfall is concerned, I will say, you raise corn anyway. Yes, if the rain is scanty and the underflow supplements or helps that, I will say you would raise a crop where the conditions of the ground are favorable to capillary attraction. If it is not, if it is hardpan or alkali or something that is impenetrable, the water will not come up to it. It is impossible for me to give the number of places and the size of them where the gumbo or hardpan prevents the effects of the underflow. I should judge they would run probably one-eighth of the land, taking it on an average. Taking it as a whole, the best corn lands in the Ar-
6485 kansas valley are the heavier lands, and all of this is more or less affected by the underflow, with the exception of the hardpan land. No, I woul ln't consider it first class corn land in the Arkansas valley in Sedgwick county where there was no influence or effect from the underflow, and the best corn lands, taking the seasons into consideration, are where the underflow produces the greatest effect, but if you wait for a wet season in the bottoms then it gets too wet for corn and you have to have a dry season in order for it to be a good corn year. As to the number of years I have farmed in this valley in which the rainfall has not been sufficient or sufficiently distributed to make corn in itself, I will say, I should judge probably a third of the time, to make a good corn crop. Yes, during that third of the time people would have good corn on land that is subject to and affected by the underflow (objection), that is, they will have better corn than they will on the uplands.
6486 Yes, I have in the neighborhood of a hundred acres of land now, made land and all. I mean by the made land that the river bank has closed in, and I have got some land out of the river. My deed calls for 77.76 acres, and I have about a hundred acres,

giving me about 23 acres of made land or a little more. I have only owned that land for about a year, and I know nothing about when that land was made, nothing only judging from the appearance of things. I should judge that the cottonwood trees on that land where the current of the river seems to have flowed at one time are six or seven years old and are from six to sixteen inches in diameter. As to how large a cottonwood tree in this county that is growing right on made land or on an island of the river will be in ten
6487 years, I would say, well, that is, pretty hard to tell, because there are so many circumstances to bump up against that no two of them will grow alike. They would average, I should think, eighteen inches in diameter in ten years, easily. If you will go down there and look where the trees are cut off you will find one year they will grow half an inch and another year an inch and a half. I think they will average an inch a year. Immediately across the river from me I don't believe there is any made land. Oh, yes, on the other side of the river up and down and all along the river on both sides, so far as I know, there is made land. It fills in in one place and cuts out in another. It doesn't cut out as much
6488 as it has filled in, in width, no, sir. Yes, sir, the river is narrowing year by year, and this has been going on for fifteen years anyway. Yes, I remember the condition about twenty years ago; we went swimming in the summer and skating in the winter. In the year 1903 I don't believe there was very much water in the river, and not much of a flow then. In the winter of 1903–4, if I remember right, after about the first of November it kind of recruited up and ran the rest of the time. I wouldn't be positive about the fall of 1902, because I lived at that time about two and a half miles from the river for about two years. In the fall of 1900 it was pretty good. The last five years of the '90's in the fall of the year I believe it was rather low as a general thing.

6489 As to the islands in the old channel of the river as I knew the channel when I first became acquainted with it, well, up in our immediate vicinity there used to be a great big one out in the river that a fellow thought he could pasture out of it, and he did so, and that one is removed, but otherwise I think they remain about the same. That fellow stretched a wire across and throwed some brush in, and the result is that he has it in his pasture. Stretching the wire and throwing the brush in filled the channel up, and the channel did fill up with sand, and there are trees growing on that. At the head of the channel it filled up above for the simple reason that the water was rushing up there against the old channel and would throw the sand up above and would bank up and the channel across there is higher than the sand bar. Yes, at that island there there used to be two channels of the river and now
6490 there is one. I expect the channel that is left is a quarter of a mile wide. I don't know just how others did in that respect, but there are other places down below there where the channel affected it that they planted cottonwood trees out on the sand

bars like and held it, but there wasn't islands in there at that time. As to whether there was any artificial assistance rendered in making these twenty-seven acres of my land, I couldn't tell you anything about it. No, I don't mean that in all cases where the river has narrowed it has been done by artificial means. I know of some instances where they did take advantage of it, and the conditions of the river were such that by doing that they could increase the amount of their lands. At the time they did that the river was low, of
6491 course. (Objection.) You can't land a piece of brush in there and make it hold when the river is up. You can attach a wire to the island and back to the bank and throw brush in there and fill up any channel in the river at any time, if you will get your wire strong enough. It makes no difference how high the water is. The higher the water the higher you fill up your place.

In coming to Wichita I come down on the south side of
6492 the river and crossed the Missouri Pacific bridge at Wichita. I have not crossed the Douglas Avenue bridge in late years. I used to when I was quite small. That was in about 1882 or 1883. Yes, sir, I remember Ackerman's island down there. I have seen Ackerman's island when there wasn't very many trees on it. Examining Complainant's Exhibit A–2, I will say that looks a little like it. Yes, I see Ackerman's island there. It is a sand bar without trees, and that is the way it looked the first time I can remember coming to town with my father. Yes, sir, since that time it has all grown up to cottonwoods.

Examining Complainant's Exhibit A–3, it looks a good deal like the Douglas Avenue bridge. Ackerman's island looks as
6493 thought it had grown clear down to the bridge. Looking at this picture, I don't recognize the place at all. I was never down there in that period of the year that I remember of on the Douglas Avenue bridge.

As to the flowing capacity of the river being as great now as when I knew it first, I believe it is. No, sir, it is not as wide. As to the islands becoming obstructions to the ordinary flow of the river to any extent, well, they may have a little, but while they did the sand was drifted in and the mud washed up along the bank until it has filled up enough higher so that it carries enough of the water, I believe. Taking the water at the same height as it was when I distinctly recollect the river, as to the carrying capacity of the
6494 river now as compared with then, I will say, I believe it would carry almost as much anyway, because I think the river is slightly deeper than it used to be. The channel, wherever it should be, moves. Sometimes it is almost the width of the river and at other times it has filled in and narrowed up. The channel in the river, if you understand it, changes every twenty-four hours or a little oftener. Sometimes it is deep and sometimes shallow, owing to the amount of water that is going down.

Yes, sir, I have seen the lands in my part of the county flooded lately. Once in a while there is trouble up there from floods, and

some injury. This is not as much as a person would think, because this last freshet at my place raised the bank, at the least calculation, fifteen inches along the part it has been overflowing, and a few more such fractions as that and I don't think it can get over on my side of the river. I have never had the river damage me any, no, sir.

Redirect examination.

By Mr. DAWSON:

6495 As to whether I have any opinion upon the question of the ground water or underflow on the first bottom coming from the river or whether some of it comes from the outlying country, I would say I have my own way of thinking about it. I think if there is any water that is spread out from the river it doesn't come out at right angles like most people suppose; that it is fed out up the river and then when it strikes where the ground slopes down toward the river it falls back in. But I would naturally suppose that the water is from other water somewhere else striking a place it could not get down through and naturally sought its level by going to the river. Yes, sir, that would be partly river water, when the river was high, and partly ground water coming from the surrounding country. That is the way I had it figured.

Recross-examination.

By Mr. ASHBAUGH:

6496 Yes, sir, when the river is high the water comes from the river back under the land, and when the river gets low it runs back under the land into the river. As to some land lying back quite a distance from the river producing corn and showing the effect of the underflow when the season was dry, and as to the elevation of that land as compared with the river, I will say, the water coming over from the river will run down over it, and it must be at the least calculation between three and four feet lower than the bank of the river, and it runs from 200 yards to a quarter of a mile back from the river.

6497 JACOB LUMBERT, Wichita, Kansas.

Direct examination.

By Mr. GREGG:

I have been farming the last two years, and before that I was raising sheep and farming, both, for twenty-two years. I am sixty-two years of age, and am farming 200 acres of land where I am now, and that is three miles east of Mount Hope and a mile south, and about half a mile east from the Arkansas river. Yes, sir, the nearest point of my 200 acres comes within about half a mile of the banks of the river, and it is all bottom land but about ten or twelve acres that is uplaud. Yes, sir, I have some sheep in connection with my

farm. I have had as high as 3,400 head at one time. I have had from 800 up to 3,400. I range my sheep out around King-
6498 man and out by Colwich in the summer time and fetch them in around Mount Hope in the winter time. Yes, sir, I have lived continuously on this farm for about nineteen years, and when I first came to the Arkansas river it was about thirty-four years ago. Yes, sir, I had sheep along that river late in the fall and early in the spring in those early days. It was thirty-four years ago the 20th of March I came here, in 1871. I came to this country along the Arkansas river. When I first located I guess it was about a mile from the river.

When I first came there in 1871 I was there two years, from the 20th of March until the 4th of July, and then I went
6499 back to Michigan. I was in Michigan four years and came back here in the fall. I was away a little over four years. That was about in 1877 when I came back, and I have been close to the river since then, within two and a half miles all the time. Yes, sir, I crossed the river lots of times, when I could cross it. Sometimes it was so deep I couldn't wade it. Yes, I have been living on my present place ever since 1886. I have been in pretty close contact with the Arkansas river during all that time. I have been there off and on all the time.

As to the flow of the Arkansas river from 1877, taking a period of ten years and comparing that flow with the flow of the
6500 river during the last ten years, leaving out of consideration very high floods, I don't know as there is a great deal of difference. There was one year after I first came back here the river was entirely dry. From the Little river up to Hutchinson there was not a drop of water in it, but there was water running in there at Hutchinson from Cow creek. From Hutchinson down to the Little river there was not a drop of water; they couldn't hardly get any to drink. That was in an early day. It was after I came back. Taking the river from year to year during a period of ten years, from 1877 to 1887, and taking it year in and year out for the last ten years, on an average, leaving out high floods, as to the average of the flow, I don't know. There is just as much water coming down now as there was then. Most every year it will get down so that a fellow can wade it with boots on. Sometimes you can jump across the channel. So that from my observation I will say I can't see any difference in it. Of course our rains here don't affect the river at all.

6501 Oh, yes, I am middling well acquainted with the farmers in the vicinity in which I am living along the river, most of them. I have been there long enough. Yes, sir, I have known them all these years; most all the time I have known some of them. As to whether, prior to the beginnipg of this suit, I ever heard any of them complain that their crops had been injured by the falling of the water or underflow, I would say, no, sir. I have never heard any of them complain to the effect that their lands had been injured

or made less valuable because of the falling of the underflow. Not at all.

As to the crops raised on my land, I would say I always raised good crops whenever we got rain. I raise corn. That is what I generally raise—and a few potatoes. As to the crops of corn generally, I would say, of course I have been here two years in the earlier times, and then I was gone four years. Those two years we raised a good crop and had plenty of rain all the time. I said it was a good thing we raised a good crop or we wouldn't have stayed here, but it was not because the river raised at all. We had
6502 plenty of rain. And after I came back we had an awfully wet season that year. As to the crops of corn in those earlier years compared with the last five or six years, I don't think there would be any difference, only the ground is worn out and not so good as it used to be, where it has been worked thirty years. If the same crops had been raised on the same ground for a long period of time, as to whether or not the strength is taken out of the soil (objection), yes, sir, it will do that.

Leaving out of consideration hot winds and grasshoppers and the difference in the strength of the soil, as to how my crops in recent years compare with those in earlier years, they have been just as good as they have ever been, if we get rains in time. If we get rains on them I don't believe there are any hot winds. If we get enough to keep the ground wet there is no hot winds.

6503 As to the values of land now compared with what they were in the '70's and '80's, when I bought mine I gave about $1,300 for the 160 acres. I have had it nineteen years and probably it will fetch me about $50 an acre, and will be about $8,000, yes, sir. Yes, sir, this is the highest price we have ever known land on the upland to sell for. That has gone up just the same as bottom land.

Cross-examination.

By Mr. ASHBAUGH:

Yes, sir, city lots have gone up in the towns around here. Yes, sir, everything has gone up. The nearest point of my land is about half a mile from the Arkansas river. I am on the south side of the river, and I live on the south side of my land. I think it is
6504 from two to six feet on my land to the water, on an average. Yes, the water level varies from year to year or at different times in the year a little. As to what causes it to vary, well, I expect it is the river going up and down. As the river lowers that lowers. I haven't dug down to see anything about it, but of course reason goes to show that, for it is all quicksand as you go down from four to six feet. After the flow of the river has been up for some time, yes, the water level is higher on my land, a little. I couldn't tell how far back that extends. All I know about it is in these draws where the sloughs

are. It goes right through the middle of it. It is only two
6505 feet there to water. No, there is no water in those sloughs after the river has been up. They are not low enough for the water to stand in. But after the river has been up the water in those sloughs is nearer the surface than after it has been down. As to whether the presence of that water level affects my corn, I don't know as it affects it any. If you can get rain on top of the ground you can raise a crop. And during the years when the rainfall was scanty, we didn't get anything then. I don't think where the ground is good for anything it will rise enough to do any good. You take them draws, they will raise nothing anyhow. The water is so cold and the ground is so cold nothing will grow in those draws. Grass will grow there, however. As to whether the underflow affects a crop of grass during a dry year, I don't know.
6506 Of course those draws are naturally wider than the ridges for the reason that the water when it rains at all runs in there. Of course my ground now is so hard I can't plow it on the ridge. No, sir, I don't think the moisture affects the river so far as raising the river. It takes a very heavy rainfall to affect the flow of the river any. If the water level rises during a dry year I don't think you would have any better crop than though the river was dry. You would get nothing. If you don't get rain you will not get any hay or anything. I have had mine that it didn't go a quarter of a ton to the acre. If you simply had a moderate amount of rain, but not sufficient, as to whether the underflow would supplement that at all or not, I don't know as it would. I
6507 couldn't tell anything about that. A fellow would have to experiment before knowing anything about it, and I have not experimented. I have not paid any attention to those conditions in other parts of the county. I haven't heard anyone complain that their lands have been affected by the scarcity of water in the river until since this suit commenced; then I have heard several of them growling about it, but not before the suit commenced. The first thing I knew of it was when Mr. Rutledge came there with a paper and wanted to get up a subscription of money to have a law suit with those Colorado fellows, and I told him I didn't want to sign any such thing. That was before the suit was brought, about two years ago. Of course I didn't pay much attention to it, and I didn't give him anything. I expect that was for the purpose of
6508 sending some one to Colorado. As to whether they sent Mr. Houston to Colorado, I don't know who was sent. I didn't attend any meeting and didn't pay much attention to it. I always stay at home and mind my own business.

As to any made land along the river, I don't know. I know it cuts out first on one side and then on the other. On Mr. Randall's pasture right north of me I think there are acres there gone into the river, wherever the channel strikes across there. As to the average channel being as wide as it used to be, I guess in most places where they haven't throwed brush in to stop it, it is. I know Mr. Llewellyn

worked there all one summer drawing in brush to stop it from coming around an island, and I think he succeeded in doing it. There was a big channel there, but he just cut brush and hauled it in there for weeks and weeks. Yes, where there is an island in the river there will be a wide channel on one side and a narrow one on the other, and he just shut that narrow channel up. It was about
6509 four rods wide on that side. Yes, it is all filled up solidly with dirt now and part of it grassed over. Brush grows up close to it. As to islands being in the river, oh, there are lots of them, but that is the only big island there. As to how long those big islands have been there, I will say ever since I have been there they have been there. Yes, there are small trees on them,—cottonwoods and willows. No, those islands will not come up in another place. If one gets out, out it goes, but they are hard to tear out after they have brush on them. There are willows on them clear around. I don't know that they are getting any larger than they ever were. There have been islands there ever since we came here. All the islands I know of are right along there by my place within two or three or four miles.

Redirect examination.

By Mr. GREGG:

6510 Yes, sir, I spoke of Mr. Llewellyn putting in brush and preparing to cut off the channel so that it would fill up and attach the island to his land. Yes, sir, the channel was there before he filled it up, three or four rods wide. Where he drawed the brush in there it was about that. Yes, sir, it was a fact that when those channels next to the island are filled and something is thrown in that way when the high waters come up they deposit more sediment and stuff in there that makes it fill more rapidly than otherwise. That is what makes it. And when the material is deposited in there it fills up rapidly so as to make it become a part of the land, yes, sir.

6511 S. M. BELDEN, Wichita, Kansas.

Direct examination.

By Mr. MELVILLE:

I am sixty-four years of age, and have lived in Sedgwick county thirty-five years in September, continuously. The first twenty-five years of my Kansas life I lived in Park township here, in East Park. My west line is about a hundred rods or such a matter from the edge of the Arkansas river. Since the first twenty-five years I have been living in Valley Center, except I was here about three years in all, as custodian of this court house, and the balance of the time I have lived in Valley Center, and my home is there now. Valley Center is about five miles from the Arkansas river.

As to my opportunities for seeing the Big river while living
6512 at Valley Center, I will say I canvassed for Stark Brothers in the fruit tree business and often crossed the river. I also run a broom factory in Valley Center and sell brooms considerably. I go to Colwich and Maize. I have seen the river quite a number of times, probably several times during the year. No, sir, I think there are no times during any of the years within which I have not seen the Big river since I have been here. While I was in Wichita I didn't get to see much of it north of the Thirteenth Street bridge. I saw some of it down on South Lawrence and up at the Thirteenth Street bridge and at the Douglas Avenue bridge. During the first twenty-five years I lived along the river I farmed in Sedgwick county. I opened up a farm and homesteaded it. I raised corn and oats, and in the early '70's we raised spring wheat and got to raising winter wheat and potatoes and such things. That was the general
6513 run of crops. Corn seemed to be the main crop with us. As to the volume of water flowing in the river during the first five years I lived here as compared with the last five years I lived on the farm, I would say it would be a hard matter to say. I can't remember specifically about it. I think, though, that in the fall of 1870 there was considerable water running. It was a dry year too. It was dry before I came. 1871 was rather a good year. There was plenty of water and plenty of rain. The rainfall was first class in 1871. In the fore part of 1872 it was good and in the fore part of 1873. The latter part of those two years it was dry. In 1874 it was a dis-trous year from the grasshoppers and hot winds, but I neve saw the Great Arkansas but what I could see a little water running at all times. Sometimes I could walk across it, and have. I drove up and down the Arkansas river in 1874 and caught fish along in the water holes. I just saw a little water. Probably I could walk with my shoes on and not get my feet wet through those narrow places. Referring to the last five years I lived on the farm, from 1890 to 1895, it is a pretty hard matter to be exact about that, but I think we had fully as much water in those years as we used to have in the others. I can't remember so positively about that. I have
6514 noticed these things sometimes. I never knew of any complaint—I can't think of any—about there not being enough water in the Arkansas river. I think there is about as much as there used to be. I think there has been fully as much water during the last five years I lived upon my farm as in the first five years. It is kind of coming to my mind now that I was a candidate for county clerk at one time and made a canvass in 1889 and crossed the river over here in Colwich and there was considerable water in it, and I hurried home before night for fear night would overtake me before I crossed the river, and I think now, as I look back, that we had running water right along. I don't believe I ever saw the Big river fully dry. 1874 was the driest year that we ever had. As to the continuity of the water and the amount during each year for
6515 the first ten years I lived here as compared with the last ten, I think we had two floods greater—we had a big flood in 1877

and a big flood in 1904. I think there wasn't very much difference. Of course I didn't see the Great Arkansas during that flood. I was confined to Valley Center. But we had a flood through our town. I will just let them stand as an off-set—1877 and 1904—and the rest of the time, with the exception of narrowing the streams and those things, I can't just satisfy my mind exactly, but I don't think there was any great difference. I wouldn't be able to swear to it that there was any great difference. I didn't see any. As to the amount of water for the years from 1880 to 1890 as compared with the period from 1890 to 1900, I would say I can't see much difference. Of course you must take that for what it is worth. But I may state that we always had more or less water in the river during those times. Comparing the period from 1875 to 1890 with the period from 1890 to the present time, it is a hard matter for me to determine, as I never thought about it. I can say truthfully
6516 that I never saw it running dry. The nearest to it was in 1874.

As to the formation of the lands and the quality of the soil on each side of the Big river within this county within a radius of ten or fifteen miles of the river on each side of the Big Arkansas river, I would say, you take that country in west of Park, the bottom land, then you strike the upland and come over into the German wheat district there and you will find a different soil altogether. You will find it more chalky and more easily cultivated. Yes, sir, I know the country there pretty well. I guess I got acquainted with that land over on the west side in 1871 and 1872. I helped to put up hay over there. On the east side of the Arkansas river the land is more spotted and more alkali, and some nice, variable soil. Then you find it where this bunch-top grass grows which sometimes in dry weather gets as hard as a grindstone.

6517 Yes, sir, I have been familiar with the crops raised on this land I have mentioned. On the west side of the Arkansas river I think as a general thing they beat us a little. Yes, sir, I am familiar with the crops raised there during the years I have been in the country, and in order to compare them fairly so that everybody will have a fair understanding, I have got to separate the classes of farmers. In the early history of the farming in Sedgwick county the land was new and any clod-hopper could raise a crop of corn because the land was new and it didn't require the cultivation. Those farmers that paid back to the land what they took from it, in the way of manure or the rotation of crops or the turning under of alfalfa and such like, have produced wonderfully good crops, while the other fellows that have gone to work and with a railroad iron broke the stalks down and raked them up and burned them and put nothing back, that land has deteriorated and is not as good as it was away back in the early history. Although the price of land has advanced, yet it is not as well cultivated and it has not produced as well. I have rode along and have seen from the car corn on one side turn out thirty or forty bushels to the acre, while

on the other side doubtless there was not more than fifteen or sixteen at the same time.

6518 Referring to those lands farmed by farmers who return a portion to the soil and comparing with the crops raised by them in the first ten years, with the last ten years, I would say I don't think the comparison is there at all. The first few years the land was stronger and it produced for one about as well as for the other, but within the last ten years it has been favorable to well cultivated farms.

Now, in speaking of that class of farmers who till the soil in the shape I speak of, that is, by fertilizing it, turning under their alfalfa, etc., and comparing the crops raised by that one class of farmers in the first ten years with the crops raised by the same farmers in the last ten years, I think the farmers now are doing just as well as they did then.

6519 Yes, sir, I have heard of the so-called underflow. As to the effect of a high or low river upon the crops upon my land, I would say that with plenty of rain and moisture in July and August the cultivation produces crops for me. No, sir, none of the moisture I speak of could come from a high river without any rain at a seasonable time. Not for me. No, sir, in all the time I was on that farm I never raised a good crop without some rain. The height of the water in the river had no effect upon my crops. Yes, there were certain spots upon my land where the corn seemed to be green, where upon other spots right alongside of it the corn "fires." My land was rather spotted. There was some alkali, and of course I don't count that at all, on the east side, and a little west of the east side of my place was what I call this fuzzy-top bunch grass, and that with plenty of moisture was always first rate, but when the dry weather set in that corn would "fire;" and then I had a kind of swale up there that was just a sufficient swale so that waters that would come down above would run down over this. In the summer of 1877 it was so much so and the flood of the Little river

6520 held it back so that until the Little river went down to drain it off, the drainage from this swale emptied into the Little river, and that was a different soil. It was more of a black, sandy loam; and on that oftentimes the corn would be greener, while on the other it was burned. Well, that grasshopper year you might say, 1874. Well, I didn't get very much corn at all that year through there; I got a little. No, sir, this swale was not affected in any way by the rise and fall of the Arkansas river.

As to the crops raised in the last five years on this farm I lived on, compared with any period of five years preceding, I would say I think I had some other five years a little better crops than in the last five years that I lived on the farm, and this was attributable to seasonable rains. I never count on irrigation or sub-irrigation at all. I never counted on it.

As to whether previous to the bringing of this suit by Kansas against Colorado I ever heard the farmers complain of their crops

being injured by lack of water in the river, I would say the first I ever heard anything about it was, I believe Brother Rutledge was in the county commissioners' office and talking about it. He
6521 and Robert Ballentine, one of the county commissioners there, were talking it over, and I heard the conversation and read an account that they were agitating the question. I don't know whether that was the time he was in the legislature or afterward, but that is the first I ever heard anything it. No, sir, I never
6522 heard any other farmers previous to the time of the bringing of this suit discuss the matter of their crops being injured by low water in the river, no, sir.

Cross-examination.

By Mr. ASHBAUGH:

6523 No, I don't think the water level on my land rises and falls with the water in the river. There may be some spots of alkali in between my land and the river. I mean where it has a kind of salty stuff that comes up on it and it doesn't produce anything. They sometimes call them sore spots. On my land there wouldn't be probably more than five or six acres of this. Yes, sir, I have had an open well on my premises and it was about six feet down to water. I didn't keep that well open only about a year. No, I can't say that that was in 1870. It was the next summer after the survey. I moved over west on my farm. I never had any other open well. I dug a cellar under my house, and I dug down and sank a barrel in there to make a cool place, and there was
6524 water came up in it. This was about six feet below the level of the land. It would seep down when the ground got full of water, irrespective of the river. I couldn't say whether the river was up when the water was in the barrel or not. I couldn't say whether the river was down when the water was in the barrel
6525 or not. Perhaps it was and perhaps it wasn't. I didn't see any variation. I haven't been on the land to do anything there for ten years. I put a pump down, and I could only tell by boring as to how deep the water was when I left the land. I bored with an auger, and when I struck the water I drove my pipe down, and I think I struck the water at about six or seven feet, somewhere along there. It was a little east of where I was formerly, but about the same height—not much difference. The land drains there to the southeast, into the Little Arkansas river. I think the Little Arkansas river is lower than the Big Arkansas at a corresponding distance from Wichita. I don't know how much. A neighbor of mine in the early days, he and I took a level and stuck that on the bank of the Great Arkansas and sighted through to the uplands across the Little Arkansas river and we concluded after putting the level on there that the bank of the Great Arkansas was considerably higher than the bank of the Little Arkansas, and that as near as we could form a conclusion from sighting through, it struck pretty nearly

along midway on the bluffs east of Valley Center. So we con-
6526 cluded that the Great Arkansas was higher than the Little Arkansas through that country.

Yes sir, the slough I referred to drains into the Little Arkansas. I think all of them drain into the Little Arkansas there. The Little Arkansas may be twelve or fifteen feet below the Big Arkansas at a corresponding distance. I never heard that it was dry. I don't believe I ever saw the Big Arkansas clear, fully dry. I have seen it dry, though, so that I could drive up and down it, but I have seen a little water running along. In the fall of
6527 1903 my boys farmed a farm there that year, in May. There was considerable water. I cultivated corn, and in June I took a bath with them in the Big river. There was plenty of water then. I couldn't say how it was in the fall. I don't believe I saw the Big Arkansas river in the fall of 1903. 1902, as I said, is included in the three years I was in the court house here, and I didn't see anything above the mouth of the Little Arkansas river. I came down here in 1900 and was here in 1900, 1901 and 1902. In the fall of 1899 I think there was plenty of water in the river. I think there was more or less running water all that time. I don't remember of any time when it was dry in that year. Yes, sir, I think the land is just as good along the river if the
6528 river is dry all the time right along as though there was water in it. (Objection.) This is my idea: You take Minnesota and all those States where there are plenty of lakes, you know, and more or less evaporation coming up, perhaps the river being full of water would have a tendency to produce more precipitation, but as far as sub-irrigation is concerned I am decidedly against the idea. I have never realized any benefit from sub-irrigation; but as a benefit to our country, I wouldn't have that river done away with for anything. Surely if other men have derived benefit from sub-irrigation I should be willing that they should retain that benefit, and I hope I am not attempting to deprive them of any benefit they have derived. I am not testifying as to other people's lands. But I don't believe it has benefitted anybody
6529 as affecting crops. I don't think it has any effect. Of course there might be some places where it is low enough. I wouldn't like to take the position of some other parties, that fifteen inches wouldn't help the roots. I wouldn't take that position at all, but if you have any water or underflow that will come within fifteen inches of the top, I am willing to admit it will help those roots, but when it comes to four or five or six feet or more, I am not willing to admit it at all. It might help alfalfa if it was within five feet of the surface. Yes, sir, alfalfa roots ordinarily might go that deep. It might help fruit trees, but for corn and wheat and oats and potatoes and such things as that, it wouldn't help it. If the underflow is maintained within two feet of the surface during a dry season, as to whether it would help or not would be owing to the kind of weather

we had. If we had hot, dry weather I would say no, it
6530 wouldn't; if it was ordinary, cloudy weather, I think it would help. If the water level was within fifteen inches of the surface it would be beneficial to corn and potatoes too. Yes, it would be beneficfal to any crop whose roots reach down into the moisture. I think some fruit trees will go down, and I think alfalfa will go down, but corn and wheat and oats and potatoes and such things as I raised in the early days it wouldn't benefit. I got no benefit at all. Yes, on my land it is too deep to the underflow to have any effect. There might be some places where it would affect it. There are places along the river that are low enough that sometimes when the water is high it seeps out. I think there are perhaps some places, but it isn't fit to cultivate. Very likely the presence of the underflow upon all first bottom lands would be beneficial to all crops raised on those lands whose roots would reach down into the underflow, and the distance would depend on the kind of crops, certainly, and the roots of some go deeper than others. I believe that
6531 an orchard planted in some of that great Arkansas River land where it could reach moist ground at four or five feet would be benefitted by the underflow. I think it would benefit apple trees, but not small stuff.

Redirect examination.

By Mr. MELVILLE:

As to when the roots of apple trees of which I have just spoken should stand in the water for a long period of time, I would say that would be detrimental, to stand in water with wet feet. Yes,
6532 sir, the land I spoke of as living on from 1870 for twenty-five years is located between the Big and the Little Arkansas rivers, and it is along the piece of low land I spoke of that seemed to drain from the Big river into the Little river, yes, sir. The slope is that way.

Referring to the well in which I sank the barrel in 1870 or 1871, yes, sir, that well was upon this piece of land that was on the east side of the land, and that well was open for a year and a half, something like that. I can't be positive exactly. No, sir, during the time that well was open it would have not been possible for the river to have remained at one station during the entire year and a half. That being true, as to whether I ever noticed any change in the level of the water in this well rising and falling as compared with the rise and fall of the river, I would say, no, sir, I did not. I don't remember anything about that. As to the effect upon the rise and fall of the water in this well if such was the case from a local rainfall, I would say that I have seen the ground so wet there that it seeped into my cellar, and I have seen it seep down and get into the barrels—leak in. Yes, sir, that would be after a rain. I have

in Valley Center a home that is two feet or more above the
6533 last overflow. I have a splendid rock cellar, and the ground became so saturated from the overflow of the Little river that I finally had about eight inches of water come into my cellar and that in time went down and went away. It soaked away itself. I didn't go into the cellar to take it out. That was caused from rains. No, sir, it didn't run in from the surface; it seeped in. No, sir, it didn't seep in from the surface moisture from this overflow. The ground became so absolutely saturated all through there that the cellars that had never had any water in them before, it came in, and came up under. Yes, sir, in that particular instance the river overflowed the ground so thoroughly that it came down the street from my house. No, sir, the water I spoke of coming into the cellar didn't flow in over the surface. I had dry ground all around my cellar, yet the water came into that.

6534 J. R. SITES (recalled for further direct examination), Wichita, Kansas.

Direct examination.

By Mr. DAWSON:

Yes, sir, I am the Mr. Sites who was on the stand yesterday. During my farming experience in this county I have had occasion to sink wells from which I pumped water to use in the irrigation of garden stuff. I sank a well between five and six hundred feet from the river in 1892 for irrigation. That well was fourteen feet
6535 deep. It was an open well. The box was about eight feet, and the balance was walled up with brick. I pumped the water every day with a windmill. I had a four inch pump attached to it, and a 6-inch cylinder. As to my opportunity for observing the water in that well and the effect, if any, of a rise or fall in the river upon the water level therein, I would say that during the next eight years following 1892 I spent a great portion of my time with that irrigating pump, gardening right around it, and there was not much of the time but what the pump would get out of fix every few days and I would have to go down in the well to fix it. My observation in regard to the dampness of the casing—it didn't make any difference whether the river was high or low, when we struck the quicksand that was always damp because the quicksand don't dry out when the river goes down. The moisture in the quicksand after you get out of the bed of the river don't vary much. It is never dry. When the river came up it didn't come up as high as the quicksand was wet, but when it went down the moisture stayed about the same distance from the surface. It stayed
6536 to the top of the quicksand and in a dry spell if the ground above the quicksand got wet it would get wet from the surface rains. The quicksand is within six or seven feet of the top of the ground.

Yes, sir, I am still farming. My farm is in the Arkansas river bottom, right within a mile of the river below here.

As to whether I am acquainted from reading or general information gathered from the people of the State with the conditions in western Kansas and their needs in respect to water for irrigation and things of that kind, I would say (objection), that I have read largely. While I have not been in western Kansas, I have read everything that has been published, almost, on those subjects, and I think I am just as competent as if I had been there and seen it. (Motion.) If the purpose of this suit and the prayer of the bill is that the water be permitted to run into and through the State of Kansas in the Arkansas river and that the decision of the case should result in establishing a doctrine which would prevent any of the citizens of Kansas or Colorado or both from taking the waters of the Arkansas river for irrigation, as to whether I think that would be of advantage or disadvantage to the State of Kansas as a
6537 whole (objection), I would say it would be a great detriment to the State of Kansas. I can give my reasons for that if you want them.

Cross-examination.

By Mr. ASHBAUGH:

Yes, sir, this well I spoke of is about one and a half miles northwest of the crossing of Douglas avenue and Main streets, on the west side of the Big river, in the northwest part of Wichita. As to whether during the flood of 1904 the cellars all around that portion of the city had water come into them from beneath, and cellars that never had any water in them before, I will say, I don't know. I had a cellar within about 500 feet of the river, a cave about eight feet deep, and it didn't come into that. As to whether I know about others over there, I would say I didn't hear of any, and I didn't observe anybody pumping any out, not in our neighborhood.

6539 OSCAR L. WINTERS, Wichita, Kansas.

Direct examination.

By Mr. GREGG:

I have been a farmer. I moved to Wichita last December. Prior to that time I lived in Eagle township and was farming there, near the town of Bentley. I am now a retired farmer. I had 120 acres of land along the Arkansas river. I homesteaded 80 acres, and I took up the homestead in October, 1869. Yes, sir, I located and lived on that land, excepting one year, in 1880, continuously since 1869. Afterward I purchased 40 acres. The southwest cor-
6540 ner of my land was about three or four rods from the Arkansas river, and I was two miles right south of Bentley. My house was about three-quarters of a mile from the river, and the land was first bottom land. That farm was located about twenty miles on the river above Wichita.

Yes, sir, the Little river flows into the Big Arkansas river right here in the city of Wichita.

Besides farming in those early days we used to herd cattle, and I worked out a good deal across the river there. We herded cattle up and down the river. We used to take in the neighbors' cattle and herd them up and down the river. That distance was
6541 three or four miles up and down the river from my place.

As to the condition of the river in those early days, leaving out the questions of floods, I would say the river was wider then; that is, the flow was. The high period would have floods at certain times along about June as we would generally have a rise in the river. In the fall of some years the river would be low and in some years it would be dry, except in holes. No, sir, that was not an unusual occurrence to see it dry in those earlier years. I have seen it dry several times. I had occasion to cross the river often, yes, sir, and I was upon it a great deal in those early days. I had kin folks over there across the river and crossed it frequently during those years, and I was in constant touch with it during all that time, yes, sir, and have been ever since. Taking a period of ten years, say from 1869 to 1879, and leaving out the floods, as to how the flow of the river in those days compared with the flow of the river in these last ten years, I can say that I have seen the river dry more in the first ten years—that is, more times—than in
6542 the last ten years, and as to the amount of water flowing during those earlier years, taking one year after another and comparing it with the various years of the last ten years, I think the channel is deeper now. Of course the river is filled in, but I should think there was very nearly as much water on account of the channel being deeper.

Taking the last three or four years, on an average, and comparing them with three or four years in those earlier times, I would say we had a great deal of water a few years ago and last year. Yes, sir, the last two years we had a good deal of water all the time, comparatively speaking.

Yes, sir, part of my land ran down within three or four rods of the river. All my land is first bottom. There is one field next to the river there that is rather low. There is about twenty acres of that, and the rest of the land is a little higher. Yes, sir, the height of the land increases a little as you go back from the river.
6543 Yes, sir, I dug wells on my land in the early days. In the spring of 1870 I dug the first one. They were open wells. I put them down in the pasture; that was about twenty rods from the house, toward the river, yes, sir; and I had to go about three feet there to the quicksand. Yes, sir, in later years we drove wells. We generally dig to that quicksand and then drive, if the water appears, and then we drive from there down. I think the first well I dug we used it that summer and then put in a pump. Yes, sir, I put down various wells in the succeeding years. We sometimes took up a driven well or pump and put it some place else when the

points got filled up, and we drove them from year to year in
6544 various parts of the land. No, sir, we couldn't tell how far the water was from the surface in driving those wells, but we generally would drive to that sand, and we would know it was not very far to water. Sometimes when we struck that sand we found water. We calculated to have the point of our pump—about sixteen feet we generally aimed to drive it. No, sir, I had no other open wells at any other point on my land, and from my personal knowledge I haven't much information as to the depth of that underflow.

When we dug post holes around the pasture and the water in the river was up, we often struck water around the pasture, and we did that from year to year, yes sir. We would have some knowledge of the sheet of water underneath by digging those post holes at the south end of the pasture where the ground was a little lower there, and in some low places where we struck water in sinking wells in the lower places.

6545 From year to year as we dug these post holes, as to whether I noticed any change in the depth of the water level, any material change, I don't think there was as long as the river was up. When the river was down it was pretty hard to dig some of the post holes in that land where we struck water at times when the river was up. Yes, sir, we would have to go a little farther before we struck the water.

Taking it at the same time of the year, or when there was no material change in the river in succeeding years from time to time, as to whether I noticed any material difference in the water level, I would say, yes, sir, I think there was. We can tell up there by our cellar. We have a cellar about five feet deep. We struck the sand and then had to fill it in. We dug too deep. Yes, sir, we got into water there. When the river would rise the water would come up in my cellar. As to how long that would be after the river came up, that would be probably two or three days before the water would get up in the cellar. As to my having noticed any material change in that water, I would say, no, sir, I don't know as I have. It is practically the same, yes, sir.

6546 Yes, sir, I know the farmers quite well up along the river there where I have been living, and I am acquainted with most of the old settlers, especially, throughout that vicinity. As to whether prior to the bringing of this suit I ever heard any of the farmers of that locality complain to the effect that any of their lands had been injured by the falling of the underflow, I would say I think not. I never heard any of them complain to the effect that their crops had been injured by the falling of the underflow, no, sir.

As to the value of lands along the river there generally in the early days as compared with the present time, I would say they are worth more now than they ever have been. Yes, sir, they have been increasing in value all the time for the past ten or fifteen years. No, sir, they have never been as high before in the history of that country as they are now.

Cross-examination.

By Mr. ASHBAUGH:

Yes, sir, I located there in 1869 and there were about four quarters of land located at the same time right in that settlement.
6547 I don't think there was any located above us in 1870, only one 80 acres. There was not a great deal taken up in 1870. In 1871 they began to come in, and in 1872 and 1873. The first bottoms were largely taken up north of Wichita and above Bentley in the years 1869, 1870, 1871, 1872 and 1873. I lived just about two and a quarter miles from Mr. Hansen, and I know his well. I moved to town last December. Yes, sir, my land is very nearly level, except the 40 that I bought last. There is a little swale runs through it. We had it in cultivation, but it is quite low. I should judge that that 40 — that I spoke of about two feet above the level of the river is about two feet above the level of the river when it is at a medium stage, and the 80 acres are about three and a half to four feet above the river at the same stage. So my
6548 land runs from two to four feet above the river. Of course there are some ridges running along next to the river. There is a sand ridge there that would be a little higher than the rest of it. Yes, sir, about 20 acres of my land overflowed at the flood of July, 1904. I don't know how long the high water stayed on my land, but it stayed on there about three weeks and killed the corn and part of the meadows. My house is right at the north line, and it is on about the highest place. I dug that cellar is 1890. Then we
6549 used to have a cave there too, before we dug the cellar, and it was dug down into the sand. I think the cave was dug in 1870. The cave was open about a year or so so that we could see the condition of the water. We used it there drawing water for the stock. The water was so near that we could reach down and dip it out at any time. No, sir, there was no time when we could not reach down and dip it out. I have seen it run full and running over. That was surface water. Yes, sir, I believe the water was higher in that well at one time than it was at another. As to what caused it to vary, I will say the river, I think. When the river was high we would have high water there, and when the river was low it was not quite so much. We sank boxes, you know, and we could tell by dipping out the quicksand. That was twenty rods from my house and three-quarters of a mile back from the river. Yes,
6550 sir, the condition of the river would determine the condition of the water in that well, and then there was a little more level place there, too, than common. I don't know how long after the condition of the river changed we would notice it in the well. We only used that well there on- year, and 1870 was rather a dry year too. But as to how long after the river rose that water would rise in the well, I should say it would be several days, and when the river would go down it would go down about so far. Yes, sir, that does happen on my piece of land in this county at least. I don't

know how far back from the river I have ever noticed that effect to be produced in a well; that is, the water rising and falling according to the condition of the river. (Objection.) I never paid any attention to it only in that well. Yes, after that I had drive wells. We generally dug them to the sand and then drove the pipe down so as to get a supply of water, and it didn't make any differ-
6551 ence whether the water was two or six feet, we generally dug to the sand and then drove pipe. There was water there in those premises in 1904. It was a little dry there in the latter part of that fall. There was water during the summer there.
6552 I don't think the water was high on my land at any time in 1904, excepting the flood of July. I think there was a good supply of water outside of that flood. I don't know how the flow of the river was in 1903 after July, nor in 1902. I think it was pretty low in 1901. 1900 was a dry time and the water was pretty low. No high water excepting at flood times. In 1899 I don't recollect. I never kept any account of the dates. During the last five years of the '90's, excepting at flood times, I think the water most of the time, excepting one year—and I don't know what year that was—it was late in the fall,—was low. In that dry year of 1901 there was no water only in holes and places. I think there was in the fall of 1903. In September, October and November, 1903, below the bridge there was a running stream and above and right at the bridge
6553 there was no water only in holes. In either 1895 or 1896 we had quite a lot of water. I think it was 1895. In 1896, 1897, 1898, 1899 and 1900 there was running water. I never saw it dry except about 1890. I don't know the exact date, but there was one year it was dry. The high water in 1895 lasted probably three weeks, and in the fall the water was low, but there was running water. During the last ten years prior to 1904 there have been good crops on my land, excepting we have had too much water. Yes, sir, my land is so located that I can have better crops when the river is low, taking it the year through, than when the river is high, so I have been troubled more during high water than during low water, yes, sir. During the first five years of the '90's the
6554 river was up, but it was never out of its bank in the five years. I can remember times during those years when it was dry in the fall during a couple of years, and especially in 1874 it was dry, but in the spring of the year we always had water—in June. The balance of the year it would be low, except sometimes when we had a freshet there the river would come up in the fall of the year and then go down again. No, an ordinary rain don't affect the river very much. No local rains have any effect upon it. Yes, it takes an excessive local rain to influence the flow of the river to any appreciable extent. As to judging of the amount of water and as to what I take into consideration (objection), well, the water that you see in the river. There is generally always water
6555 in the spring of the year in the river. In judging of the amount of water flowing, I generally take the height of the

water into consideration. Yes, sir, I always do. That would be the first thing to judge from, yes, the height of the water. Yes, I take the width into consideration. No, the banks are not as wide as they used to be. I think the channel is deeper across where we are. Yes, there are a few is lands there. Now, omitting those islands, the flow of the channel is deeper. I haven't measured it; I am just judging
6556 from appearances. I couldn't tell how much of the river channel these islands occupy. There is one island there below, probably there is an acre or so in it. The river used to run around that island and now it don't. It is all on one side now. On the other side it is filled up. Yes, there used to be two channels there. As to how high that land is above the low water mark of the river when I first knew it, oh, there was great trees on that, and grass and vegetation grown on it the first time I ever saw it. I don't know how high it is above the low water mark. It is larger. The island is larger. I don't know whether it is higher or not. I don't think that island overflows, unless it was a real high water. Yes,
6557 sir, I was there in 1877. I don't know whether that island overflowed or not. That island didn't overflow in 1904. It is the south channel that has filled up there. That channel thirty years ago was several rods wide. I don't know as that island is much larger now than it was thirty years ago, but it has filled in. It is lower where it has been enlarged—lower than the original part, yes, sir. I should judge the channel on the north side as it flows now between that island and the bank is three or four hundred feet wide. There are young cottonwoods grown on there. That
6558 original south channel overflowed during the flood of 1904. I don't know whether it has overflowed during the last two or three days or not. Yes, it overflows during ordinary high water, but it wouldn't be very deep. Perhaps six inches. Yes, there are cottonwoods growing there where that south channel used to be, and they are clear across from the south bank to the original island. That part of the river, then, no, sir, is not deeper. Yes, the
6559 main channel is on the north side of the river. No, I don't know of any other place where a channel has filled up. In coming to Wichita we generally drive down the river road; that is, between the two rivers. We strike the river at several places. I should judge the bridge there at Bentley was three or four hundred feet long. No, in digging post holes on my premises I
6560 didn't always find water, but we always did when the river was up. When the river was up we would sometimes find it within six inches of the surface, and when the river was
6561 down we never did dig to water in setting post holes, when it was dry. We aimed to dig our post holes when it was wet, when the wet soil would dig easier. Yes, we could dig it when it was dry, but the ground was hard. In the extremely dry spells we have I know some of those low places we have there it is a little more clayey than others. No, there is no gumbo or clay under it. I don't think there is. But in some places it is not as sandy

as it is in others. In parts of our land it doesn't make any
6562 difference in the water level whether the river is up. Yes, sir, when the river comes up to exactly the same point in height that it did thirty years ago, the water level will be just as high on my land as it was then. That is what I meant to say, and that is the exact fact. And when the river is down it will go
6563 down just as low as it did thirty years ago, yes, sir. (Objection.) I know the water level is lower when the river is dry than when the river is full. There is always dampness when you strike that quicksand. If you go down deep enough you always get water.

I spoke about land being more valuable now. Everything is more valuable in this county now than it was thirty years ago, yes, sir. Prices are higher. There are better improvements all through the county, larger cities, better markets and better facilities
6564 to do business here. That is all true.

Oh, yes, I have heard something about the people in Colorado taking the water for irrigation. (Objection.) Yes, it has been discussed up there lately since this suit was begun, but before that time not very much. Yes, sir, I have heard it before the suit was begun. I don't remember when. The tenor of the discussion was sub-irrigation. That is what they were talking about. I
6565 haven't paid much attention to it. There have been men at my house there that would come there to talk it over, and the tenor of their conversation was that they didn't want them to take the water out of the river up there. (Objection.) That is
6566 just what I heard them say. What effect it would have upon our sub-irrigation, I don't know. I didn't pay much attention to it. As to what effect I think it would have to take the water from year to year for irrigation in Colorado, upon the sub-irrigation in the Arkansas valley in Sedgwick county, I couldn't tell you. I don't believe it would hurt me very much or my ground up there, situated as my ground is, no, sir.

Redirect examination.

By Mr. GREGG:

As to who it was that was talking to me about this matter, I would say, well, Mr. Oldfather was the first one that talked with me
6567 about it, and Mr. Harrison was the next man. I don't know that Mr. Rutledge was ever at my place. Yes, sir, he did some of this talking concerning the matter. I think he is the person who introduced the resolution in the legislature. No, I didn't care much about the matter. I didn't care anything about it.

Yes, sir, I remember about that certain island near my land where the channel on the south side of the island had been filled up and the island made a part of the land. It is right south of me, on the south side of the river.

6568 Recross-examination.

By Mr. ASHBAUGH:

No, sir, I didn't know about it, that Senator Vincent of Reno county introduced that resolution and that Mr. Rutledge was not even a member of the legislature then. Yes, from what I can read I think Mr. Rutledge took an active part in that matter. That is all I said, and that is my understanding about it.

6570 J. W. SITES, Wichita, Kansas.

Direct examination.

By Mr. DAWSON:

I live eight and a half miles from the city of Wichita, and within about three miles of the Arkansas river, and I have lived in that locality, with the exception of three years, since 1877. Yes, sir, I have owned land there since 1877, and own land there at this time. I am interested with my brother there in 800 acres of land. My brother is George T. Sites, and we are both engaged in farming.

As to my opportunities since 1877 for observing the Arkansas river and its flow in Sedgwick county, I would say in coming to town once a week or probably twice a week, or sometimes when I was hauling grain I would come every day, and that has continued generally from 1877 up to the present time.

6571 As to the average flow of the river over a period of the last ten years compared with the average flow of the river over a like period in any of the earlier times I have known the river, based upon my observation and judgment, I would say the average has been greater for the last ten years, and especially for the last eight or nine years, than it ever was since I have been here.

My land runs up into the foot-hills a little on the west side, but the principal part of it is first bottom land, with the exception of what is called the Big Slough. That is lower than even the first bottom land.

Yes, sir, I have had opportunities for discovering the depth we have had to go in order to strike water on my lands, and my opportunities for observing the level of the ground water have extended over the period since I have been on that place. We have opportunities in various ways. The best opportunity I ever had was in setting in curbs to water stock. I just dug down and set in a curb and left it open on one side, in the slough ground there, so that the stock would go right there and put their heads in and drink

6572 right out of the curb. As to how the water level in my locality beneath the surface of the ground compares now with what it was when I first knew the country, I would say I can't tell any difference.

As to what I depend upon to make a corn crop or other crops on my land, I would say we depend upon rains. When we have continued dry weather of course at that time of the year it is always hot and we have hot winds and it injures the grain. If we have good

and seasonable rains we always raise good crops. I never could tell that the influence of the river made any difference on my crops at all. I saw it when we had continued dry weather and hot winds, that although the river was full of water our crops would become injured just the same as though the river were dry. I couldn't tell any difference in regard to the crops when we had good and seasonable rains but a dry or low river. We had good crops when we had the rains, and when we had drouth and hot winds it injured our crops.

6573 As to whether lands that have been farmed for a number of years run down and deteriorate, I would say yes, sir, and especially under some circumstances where it is extremely wet or anything of that kind and the farm is out of condition it will just simply exhaust the land. Making allowance for any deterioration by reason of farming, as to whether there has or has not been any change in the productiveness of my lands since I have been farming where I now am, I will say, no, I can't see any difference scarcely. If we have good seasons we get a good crop the same as we always did on that land that has been kept up.

As to whether or not before the commencement of this suit or before the agitation was commenced in Wichita I ever heard any of the farmers in my locality complain of their lands becoming less valuable or productive because the river was being dried up or the level of the ground water was falling (objection), I never heard

6574 any complaint from the farmers. As to having heard the farmers talk in my locality in reference to this matter since the suit has been commenced, and as to the advantages or disadvantages of the suit as to them, I would say (objection), well, the farmers generally take it as a kind of a joke. They look on it as a kind of a farce. Nine-tenths of them, at least, that I have talked with do.

Cross-examination.

By Mr. ASHBAUGH:

I am interested in 800 acres of land. It is on the west side of the Big river, and the nearest part of it is two and a half miles and the farthest part about three and a quarter miles back from the

6575 river. No, it is not all first bottom land; it runs back into the hills on the west side. I have 160 acres of land up by Maize that is all in the bottom. The water on my land at the nearest place is about two and a half to three feet, and at the farthest about twenty feet. My house is located just out of what we call first bottom, on a knoll. The low land I spoke of occupies perhaps 250 or 300 acres. Yes, sir, the Big slough runs diagonally through it. At my place it is about three-quarters of a mile wide, but it

6576 don't all run on my land; it extends over onto the other side. The Big slough heads up northwest of here somewhere, up above my premises. I think the Big slough empties into

the Big river south of Wichita. In the Big slough it is two and a half to three feet to water. We put the first of those curbs down about twelve or thirteen years ago in the Big slough, in the pasture, and left one side open so that the cattle could put their heads in to drink. Those curbs are there now. Yes, the water in those curbs is higher at one time than at another when we have rains to fill them up, but during dry spells from year to year I have
6577 never noticed any difference. I have never noticed that the river has any influence upon them. Those curbs are about two and a half miles from the river. Between the slough and the river it is first bottom, good farming land, most of it, some sand streaks in it, and is higher than this slough. On the land between these curbs and the river I think you would have to go five and a half to seven feet to water at any time. There are sand streaks there and then there is good, heavy land. I don't think there is any gumbo to amount to anything, but a clay sub-soil. I never could tell that the condition of the river made any difference whatever on my land, unless it overflowed. No, we can't tell the condition
6578 of the river by looking into these curbs. I have never noticed such a difference at other places, of course. This slough is about the same width until it gets back above my place. It is narrower after it gets above me. An ordinary rain raises the water in it. Most any rain of any consequence will raise the water in the slough, but not a light rain. A heavy rain will fill it full. I don't know how many times that slough was flooded in 1904. It was full last year and remained full quite a while. I couldn't
6579 say definitely how long. Probably a month or so. I think that was in June, if I am not mistaken, but it was at the time of the big flood here in Wichita. Yes, that Big slough was flooded for three or four weeks, and was quite deep. It would come almost up to the box of the buggy in crossing in places. Of course it didn't extend all over the ground in the slough that year, but in many places it would come up to the box of the buggy. Yes, I think that slough runs around west of the city of Wichita about two miles or a little more—perhaps three miles. Yes, it is
6580 the same one that is known as the Big slough, west of the city here. I never knew that it got any higher than it did in 1904. I expect there have been times when it was about the same. Last winter there was water came down and overflowed from the river, and there was water came down in an overflow from the river in 1895, during the big flood in the river, and that overflow came down the Big slough. I think last year it lasted some-
6581 thing like three or four weeks. I don't remember it overflowing from the Big river except these two times. I couldn't say how many times it has overflowed from a rain. It gets full sometimes several times in the year, and then I have seen it when there was no water much only in the slough channel. Oh, yes, there are years that at some time in the year there is water in that slough channel at my place. At heavy rains there is water in it,

and the depth will depend upon the rainfall. No, the river does not influence my land except when it overflows from it. We have had some of our biggest freshets at times when the river was dry, and then of course we had big rains when the river was full. A man couldn't tell definitely anything about that without he kept a record. No, I am not prepared to state what influence the river has upon the general rainfall of the valley. I couldn't tell you.

6582 I don't know as I ever heard any statements one way or the other about it, and I have no well-arranged observation so as to support any theory about it. In 1895 the ground got so dry that we had to quit plowing for wheat and went to putting up hay and we were at work at the hay and the river had been full of water for quite a while, and so after we had worked at the hay a while and had several stacks of it up it was reported north of us that the river had overflowed and come over into the Big slough north of us, and we didn't know whether it was so or not until next morning we went up to the field and found that the water was standing all around our hay stacks. The river flow had got down that far.

6583 But the drouth and hot winds continued on for probably a week or ten days longer. After that we had rains, and they stopped the hot winds. Yes, that was an extreme flood, but I don't know that it was so much of an extreme drouth. We have had lots of them. We always have had since I came here. We used to have more, I think, than we have had lately; that is, previous to that time. No, we didn't have any drouth last year. The last severe drouth we had was in 1901 when the river went dry or practically dry. The first time I ever saw the river go dry was in 1879. It was the driest that time that I ever saw it. I was not here in 1874. I think we had good crops in 1879. We had good local rains, but the river was dry; in 1895 we didn't get a full crop. It was injured some

6584 before the rain came. We were injured by the drouth that year. The flood didn't injure me; it only overflowed the grass land. It might have been some slight injury in that way, but it didn't overflow my farm land.

I couldn't give the least idea in the world as to how many farmers there are in the Arkansas valley between the south line of Cowley county and the west line of Hamilton county.

6585 No, I never heard any farmer talk about this suit outside of Sedgwick county. No, the farmers I have talked with about this were not of other counties. (Objection.) There are a few farmers in my part of the valley that are similarly situated to me along the Big slough there. I think the Big slough rises up somewhere about Mount Hope. I don't know the length of it. It

6586 may possibly flow into the Cowskin creek and then into the river. I couldn't say definitely. I don't know whether it rises in Reno county or not. I am told it rises about sixteen miles northwest of my place, and I am eight and a half miles from Wichita. Yes, the whole length of that slough would be about thirty-six miles.

Yes, sir, I am a brother of the J. R. Sites who testified yesterday.

6587 J. T. SITES, Wichita, Kansas.

Direct examination.

By Mr. DAWSON:

I live eight miles northwest of here, in Park township. I am a brother of the Mr. Sites who just left the witness stand. We farm and work together, yes, sir, considerably. We own our land together, and between me, my brother and his wife we have 800 acres, and that is located about two and a half miles from the Arkansas river and about eight and a half miles from Wichita.

As to my opportunities since I have been living in that locality to observe the flow of the river, I would say I have seen the river every week, sometimes two or three times. I have lived in
6588 that locality since 1878.

As to the flow of the Arkansas river for the last ten years compared with the flow for a like period in any of the earlier times, from my observation of the river from week to week since 1878, I would say it seems to me there has been more water going down the river in the last ten years, especially eight or nine years, than there was in any years previous to that time.

As to my opportunity for observing the level of the ground water underneath our land, I have dug several times to put down drove wells. I had no augur at the time. I dug some two or three wells, and then those boxes that my brother and I used to put in the slough, is about all the observation I have had. When we dug wells we just dug to first water and then we drove a pipe. On our bottom land we generally got first water at about four to six feet. As to whether there has been any change in the water level on my land since I located there, I don't see that there has been any.

6589 Yes, this Big slough that was spoken of by my brother runs through a part of my land. At least one side of it does, yes, sir. As to whether I know of any place where the river in flood time breaks over the slough, I will say there is what they call a little slough that joins the Big slough about half a mile north of our place. It goes more directly up to the Big river. It is only a short distance up there, some two miles, probably, and that is the only place I have ever observed it where the river in flood time breaks over into the slough. Yes, sir, it does break over there sometimes from the Big river and goes into the Big slough.

As to what I depend upon to raise a good crop on my land we have to depend on rain. As to what influence, if any, I have observed the river to have upon crops produced there, I have never seen any influence whatever.

When land has been farmed for a number of years, as to whether it shows any wearing or deterioration by reason of farming it, I would say I think it does where it is farmed in corn continuously. Making allowance for any deterioration of that kind, as to the productiveness of my land in late years as compared with

the productiveness in earlier years, I would say I think it
6590 is just as good. No, sir, there have been no changes in the water conditions that have caused my land to fail in productiveness. As to whether I have noticed anything as to the kind of crop I could get on my land in a year when the rainfall was bad but the river was up, I would say we got little crops when the rainfall was bad, always. We have had good crops whenever the rainfall was seasonable. As to whether I ever heard any of the farmers prior to the commencement of this suit farming lands in my locality complain that their lands were made less productive or less valuable by reason of a change in the river or a change in the level of the ground water, no, sir, I never did hear anyone say so. As to whether since the commencement of this suit I have had occasion to talk with any of the farmers in my part of the country as to the suit and any benefits that might accrue to them by reason of it, I have never talked with the farmers a great deal about it. I never did seriously. It was always in a kind of joking way, as the farmers all seemed to be joking about it. That is about all
6591 I heard. No, sir, none of the people active in this suit came to me to talk or ask for aid in it.

Cross-examination.

By Mr. ASHBAUGH:

I think the flow of the river in 1903 was good. It may have been dry part of the fall. I can't recollect exactly. In 1902 I think it was fair. I have no definite recollection any more than in a general way as I noticed the river, nothing particularly to call my mind to it one way or the other. Yes, sir, I can always remember 1904, because there was a great flood. I was not here in 1877. I
6592 don't think the flood stood in the Big slough in 1904 more than two or three weeks. My understanding is that it came down from the river. I think the rains north of us caused it to come up. We had rains there at our place at that time. I wouldn't be positive about that, but I think so. The rains up in Reno and Rice counties are what caused that flood, I think. Yes, sir, that made Cow creek high. I don't think there was any rain at our place just at that time. I am not positive. It got high enough so that the river flooded over into the Big slough and came down through that slough. That is my impression. As to how deep it got in that Big slough, it
6593 was up to the buggy bed. Of course it would rise in the middle of the slough. I suppose the slough was about three-quarters of a mile wide, and at one time it covered it all. There was not more than two or three acres out, maybe, in six or seven hundred acres of land. Yes, sir, I knew that slough to overflow in 1895. I don't think it was the Big slough at that time; it came from the little one. It got into the little one from an overflow from the river. I think the Big slough heads up in Reno county. Yes, and there is a little one that heads here in

Sedgwick county. In 1901 I think the river was low most of the time. We had a drouth here then. I think in 1904 it was a seasonable year. The river had water in it most of the time.

6594 I have no recollection of it definitely, not any more than most any other year. We hardly ever noticed it. If the river goes dry any length of time we generally notice it and recollect it, but if it don't it slips our minds, if there is not a severe drouth right at that time. Our land is so located that the mere presence of the water in the river would not be noticeable by us unless we had occasion to go and look at it. No, sir, I never saw the water rise in those curbs a bit. I should judge that on the land between us and the river, and especially straight east of us, it might be twelve or fourteen feet to water, but you take it northeast, I suppose it wouldn't be that high. As to whether I know *known* when the rainfall was low and the river was up that we had poor crops, I would say it was in 1895. As to whether that is the only time I have ever known that, well, I couldn't recall the years; I don't remember it. I never saw any effect from the river at that time.

6595 Yes, located as our land is, we are dependent entirely upon the rainfall. Yes, the condition of the river does not make a bit of difference to us so far as the productiveness of our land is concerned, just so it doesn't overflow. Yes, sir, just so it will let us alone. Yes, if you took the whole thing away it would hurt our country, but I don't think it does hurt anybody. But it wouldn't affect my land. Yes, sir, that is true, it wouldn't affect my land if you took the whole river away. The only injury that could come from the river to us is through these floods, yes, sir. In coming to Wichita we cross the Thirteenth Street bridge, and we come within half a mile of the river once or twice, but we can see it

6596 plainly. We can see it by looking up northeast. As to what I take into consideration when I just look at the river and judge of the flow, I will say, why, by the amount of water that is coming down; that is, by the height of the water and how full it is. I don't know that there are any more trees along the river than there used to be, outside of the river. There may be on the

6597 islands. I think there are there. Yes, I think there are more. Oh, yes, I notice a difference in the appearance of the river from the Douglas Avenue bridge now from what it used to be. It has filled up at the sides and made ground, and of course they have narrowed it up, and the island has got larger, and no doubt in crossing the river it looks quite different now than it used to. Yes, I crossed the bridge in 1878.

Examining Complainant's Exhibit A–1, I will say, I guess that picture looks natural. I don't know much about it. No, I never saw that picture until now. I think I recognize the old wooden bridge that was there in 1878. No, I think I don't see the island in that picture that I just spoke of.

6598 Examining Exhibit A–2, I will say, I don't see any island there. Oh, yes, a sand bar, I see now. As to what I see in

that picture that is known as the island now at the bridge, I will say it is covered with trees now and everything is cut off there at the end. I suppose that must be that sand bar that is shown by the dark streak at the left side of the picture. Yes, I crossed the Douglas Avenue bridge this morning. Yes, I noticed that the island has now grown under the bridge so that you can see it from the lower side of the bridge. Yes, I could see it this 11th day of May, a couple of rods or more below the bridge, and I notice trees on the island, and also trees right near the street car bridge just north of the
6599 wagon bridge. Those trees have been cut down lately. I think they were cut down since the flood last year. It must have been, for I noticed them cut down there.

Examining Complaidant's Exhibit A–3, I will say I recognize it. I don't see any island there. I can't see anything except those trees over there that I can tell. (Objection.) No, I think the island don't appear, so far as I can see it. I think the water in high water would run over that sand bar as shown in Exhibit A–2.

6600 As to the river narrowing from the Thirteenth Street bridge up, I have never thought they narrowed much. They may a little. There is one island that appears at the Thirteenth Street bridge, but it is about filled up on the west side I think. The main channel is on the east side. There used to be a channel on the west side that is now about filled up. Yes, I remember that there are other islands all up the river. There is what we call Swan's island. The main channel at Swan's island is on the west side. I think the other channel on the east side is filled up, and that island is taken into a farm over there. That is what I understand. I think that condition exists up and down the river here as far as I know. I think it does.

Redirect examination.

By Mr. DAWSON:

6601 As to whether I have ever known any of the land owners to artificially aid in the attaching of any of these islands to their lands, well, yes, I see up here on the Thirteenth Street bridge another island they have been filling in there or attaching. I have seen that for years. And there is another island right down here that they have built a bridge across and made a dam of it, and a man by the name of Greenleaf has it, and that is only a mile or so northwest of town here. He cut off a channel there. Yes, sir, when there is a small channel that has water in it during a flush flow between an island and the mainland and you stop up the head of the channel, when the river gets up again and goes over that it deposits mud and stuff in there. They fill up the old channel and somebody takes the island. That is what it is done for.

As to what my observation has been as to the effect of confining a flowing stream, if you make it narrower, I would say it digs it out and makes it deeper, most certainly, and I think it has done so with

the river. Yes, sir, I know that just below the Douglas Ave-
6602 nue bridge there used to be an island that a man named Davis had something to do with. It was dug out and taken away, I think, about all of it, or maybe all of it, I am not positive. The lower end of Ackerman's island extends down below the bridge that way, towards this former island.

No, sir, there is no hardpan or gumbo land that prevents the water coming up or going down in the soil on the lands that my brother and I have been testifying concerning, and it is not because of that that the river does not affect our land, no, sir.

Recross-examination.

By Mr. ASHBAUGH:

I don't think there is any made land along the river right near our premises. I don't recollect any there. Right due east of me I haven't been down to the river for some time. There might be made land there and I not have noticed it.

6603 L. B. DOTSON, Wichita, Kansas.

Direct examination.

By Mr. DAWSON:

I live about ten miles northwest of Wichita, and my home place is now a mile from the Arkansas river. Yes, sir, my farm adjoins the river, and I have a frontage of about half a mile on it. I own 460 acres of land and have lived there since 1871 and have been acquainted with the Arkansas river that long. I am engaged in farming and stock raising.

6604 As to what opportunity I have had from week to week to see or observe the Arkansas river, I see it every few days. I work a great deal right on the river, and that has been true ever since 1871. As to the flow of the river during the last ten years as compared with the flow, on the average, for any other ten years before that time and since I have known the river, I would say I rather think there has been more water in the river in the last ten years on an average generally than before. I should think there would be. As to the dry or very low spells of the river being as often during the last ten years or lasting as long as in the earlier years, I would say I hardly think they were. I hardly think they would last as long. I don't think there has been any material or noticeable change in the river, taking it over a period of ten years, since I knew it. I suppose I go, to the first water, on my land something like four to six or seven feet, and I am on what is known as the first bottom. That is, part of my land. I raise all kinds of crops—corn, oats, wheat, millet and everything of that kind
6605 that is raised on a farm. There has been no change in the general water level under my land since I have been there that I could ever notice. That is, only in a real dry time the water

wouldn't be quite as close to the top of the ground, but as to the general average there is no difference. No, sir, there has been no change that would last over a year in late years from what there was in earlier years. None that I could ever tell. The difference I spoke of there being at a real dry time or in low water, as to what kind of land it was on, I would say it was on very low land. When the river was full and we would have plenty of rain the water would be close to the top of that ground on that land, and as to that being close to the river, I would say where I live on my land it is just about a mile from the river, and that would be at that distance at my place and that far back, yes, sir. As to what I depend upon to make a crop on my land, we raise corn and wheat both,
6606 pretty equally divided. The rain from above. No, sir, I have never noticed that the river had any particular influence on the kind of crop I raise, provided it didn't overflow or flood it.

After land has been farmed a number of years I think it shows a running down or deterioration from being cropped in the same crop, to some extent. Making allowance for that running down that comes naturally from cropping land a number of years, as to the productiveness of my lands, compared now with what it was when I went there, I would say it is about the same. No, sir, there has been no change in the water conditions that has affected the productiveness of my land either for better or worse. I think not. None that I could tell.

As to whether before the commencement of this suit I ever heard any of the farmers up in my neighborhood who farm land there complain that their lands were being made less productive or less valuable because of the drying up of the river or the sinking of the water level, no, sir, I haven't heard any particular talk about it amongst the farmers. Yes, sir, I have heard it amongst others. Mr. Oldfather was the first man I ever heard mention it. Mr. Oldfather is a farmer. I don't know how much interest he has
6607 taken in it, but he is the first man that mentioned this business to me. And I have had some little talk with Mr. Harrison. He is a farmer.

Cross-examination.

By Mr. ASHBAUGH:

My land is about ten miles up the Arkansas river, on the west side. My house is about a mile from the river, but my land adjoins the river. One quarter lies right along the side of the river. I have owned that quarter where I live since 1874, and the other I bought something like twenty years ago. It is like all the
6608 bottom land along the river. Farther back from the river it gets a little higher. I dug a stock well at the house and got water at that at eight feet. I have another stock well next to the river where I go about four feet. That is on middling low

pasture land. When that water is four feet down there, as to the river being up or down, well, that is when the river is comparatively full. When the river is down and stays down for a long time it affects that well some little, yes, sir. Not to any great extent. Yes, when the river is down I can tell by the well that it is some lower. Yes, sir, I can tell the stage of the river to a certain extent by looking at the water in that well. You can in that
6609 one well that is pretty nearly on a level with the river, but at my home place you can't particularly tell, because it is on higher ground. No, my land is not what we would call regular gumbo. There is a sediment before you strike the water that is a kind of blue-whitish clay, just before you get into the quicksand. That is, you go through that just as you get into the water. I suppose it is a foot thick, and it runs right on top of the bed of the water. Yes, that is just as hard as it could be pretty nearly. Oh, yes, you can dig through it with a shovel. We sometimes dig through it and sometimes bore. When you strike that it takes a great deal of work to get through that, and I very often have dug through it. I suppose the water would soak through, but it is pretty hard. Where that clayey surface is over the water, as to whether the water would respond above it to the conditions of the river as
6610 readily as though that particular clayey substance was not there, I couldn't say about that, but I wouldn't think it would. Yes, sir, it is a closely packed, hard clay surface. Yes, sir, I was here in 1874, and in 1877. Yes, the flood of 1904 flooded my land some. It didn't get so very high. Probably the deepest—there is a channel or kind of low place of ground that runs along the river. I expect that—well, it swam a horse in crossing. It would be five or six feet deep, and was eight or ten rods wide. I don't suppose that depth was more than eight or ten rods in width, but then it would get shallower over the land and ran back a couple of
6611 hundred rods. I should think there was twenty acres overflowed in all. That water stood on it for several days. Whenever the water gets up to the level of the bank of the river it runs over my land. It takes a pretty high flood to do that, yes, sir. My land is flooded right now. I have ten acres of wheat that is under water. I guess the water is going down now, but this last rise we have had here I have ten acres of wheat now covered with water, but not so very deep. It has been covered ever since the rise in the river that we had here, two or three weeks, and it has been higher than it is today and a good deal more ground was covered with water than there is at the present time, a week ago. Then I suppose there was ten acres covered.

6612 In coming to town I drove over the Douglas Avenue bridge. I didn't look at the river particularly. I didn't pay any particular attention to it. I should think the water was six or eight feet below the bridge this morning, something like that. Hardly that much, perhaps. The river at my place this morning was below the banks of the river I should say probably a foot, and last

night it got considerably higher than that. I should say
6613 fully two feet. It was considerably higher, perhaps two feet, last year than this. Last year my land was flooded only at that one particular time. It never got off the wheat. I had sixty acres of wheat adjoining the river and was seven weeks getting it cut, and I had only ten bushels to the acre. I got 600 bushels off 60 acres, and I think my wheat would have made twenty-five or thirty bushels to the acre if it hadn't been flooded. No, the wheat was not a good quality. It was bleached and fell down and I couldn't cut it. This last year and this year had been about all in the last ten years when the floods have damaged me particularly. I don't remember that the flood of 1895 did me
6614 any particular damage. I wouldn't say positively, but I don't remember the years. During the last ten or twelve years the floods have broken over my land a time or two. I can't remember exactly. But they didn't stay on the ground so long as they have the last two years. Yes, in considering the average flow of the river during the last ten years I have included these
6615 floods. I think we had some water in the river, if I remember, in the fall of 1903. I think 1902 was about the same. I think we had about the normal amount of water. 1901 was pretty dry through our section, and the river almost stopped running. There might possibly have been a little running water in pools and low places, but no appreciable running water in 1901. I
6616 couldn't say how it was in 1900. During the first ten years that I was there my land was not flooded to amount to anything. That would be from 1871 to 1881. I don't think it overflowed from 1881 to 1891 to amount to anything. Right where my land adjoins the river I believe it is wider now than it used to be. Taking it on an average for two or three or five miles, I think it is narrower. Yes, there are islands in the river along there. They are larger, and some are washed out. They were washed out during the flood. Yes, it is true that the islands grow during the dry period, and some of them wash out during the flood periods. Yes, there are some of them getting trees on them now that didn't have them before. Yes, I know of places along there where years ago there was a sand bar and where there were two streams to the
6617 river. Yes, sir, and I know of such places where one of those streams has closed up in the later years. I couldn't tell you how many such places there are along the river for ten or fifteen miles above Wichita. I know of two or three in my neighborhood that are that way. I believe the island has grown larger in that particular place; that is, it has filled in and growed up with trees and willows; and I believe the channel has gotten to be deeper than it was years ago. I haven't measured any of them, but I have crossed them just the same. Yes, in those places there is always a wide channel and a narrow channel. Yes, I have known such
6618 places where the narrow channel has filled up and the island has become attached to the mainland and the narrow chan-

nel has just grown up with trees—filled up with sand and cottonwoods and made land, so that the island is practically a part of the mainland, that is true, it adjoins the mainland. I know of two or three such places. There are some of them about half a mile from where I live, but not on my land. So I didn't get any made land. It washed me out. I didn't happen to have any willows or trees adjoining my land, and no islands, and consequently it has been digging me out. I am about three acres short of when I bought it, and it has given it to my neighbors. I should think my neighbors have more than three acres more—I expect ten acres—somewhere along there.

6619 I crossed the river at Wichita before there was any Douglas Avenue bridge, when the old ferry was here. As to having seen cattle swum across the river there, I will say I have done that myself.

6620 Examining Complainant's Exhibit A–52, and as to whether that is a fair representation of the swimming of cattle across the Arkansas river in those early days (objection), I will say that looks something like it. It looks a good deal like it. (Objection.) I never saw as many cattle strung out in a string like that, though. They are most generally in a bunch. I have helped swim

6621 200 across at one time. During those times, as to how I crossed the river, I swam just the same—I swam my horses. We couldn't get them on the ferry. I don't remember whether the ferry was running at that time. Right where the bridge is now, I have swum them there, and then a mile south of here I have swum them. I swam them until there was a bridge here. I have swum them right here where this bridge is, after the bridge was built. Yes, at the location of the Douglas Avenue bridge, I have

6622 swum them there. I think that was in 1871, and it was in the summer. I couldn't count the times that I helped swim them. That is, not so awfully many times here. For two or three years we used to swim them instead of crossing the bridge, after the bridge was built, and we swum them for a year or two after the bridge. It was quite a job to get the cattle on the bridge, you know, and we used to swim them instead of crossing the bridge, and then there was some toll to be paid.

Examining Complainant's Exhibit A–1, that looks very much like the old wooden bridge at Douglas avenue. I never saw that picture until you handed it to me a minute ago. I have run cattle

6623 on the north side of the bridge and swum them down under it, under the first tier, and crossed down and came out on the other side. We started in on the west side of the river and drove them under the first panel or span and let them come through there and swim to the bank across on the east side. We put them in on the north side of the river and took them out on the south side of the bridge, at the east bank. Yes, sir, sometimes we had trouble

6624 in getting our cattle under the bridge at that time, for in getting under the bridge it was pretty close sometimes. We

wouldn't have any trouble in getting under the bridge because it was all under water.

Examining Exhibit A–1, I would say it looks very much like it was at the times when I swam those cattle under it. Yes, I recognize it as the bridge and the river at the place I have described. I would think that sometimes when we swam the cattle across there it would be higher and at other times about the same, as it is
6625 in the picture.

Examining Exhibit A–2, I recognize that as the bridge as I saw it in those early days. It looks something like that. Yes, I think that is the iron bridge, built after the old wooden bridge was taken down. I can't say that Ackerman's island shows on Exhibit A2. I think there is more island there now than there was then. I rather think the dark streak at the left of the picture is the old sand bar that has grown into Ackerman's island, yes, sir. No, there were not as many trees on it in the earlier years as in the later ones.

Yes, there were some trees on it the first time I ever saw it,
6626 not very far above the bridge. Yes, I crossed the Douglas Avenue bridge this morning. That island extends down under the bridge and is seen from the south side, and the river is pretty high this morning.

Examining Exhibit A–3, I would think that was the Douglas Avenue bridge. I don't think Ackerman's island shows in that at all.

In testifying concerning the flow of the river in these later years, I took into consideration the amount of water that is in the river. It is about the same in the banks, judging by the banks of the
6627 river. Yes, sir, I judge from the height of the water also.

Yes, it is the one thing I look at—to see how high the water is on the banks. Yes, sir, that is the main point that I took into consideration.

Redirect examination.

By Mr. DAWSON:

Referring to Exhibit A–3, whenever it was taken, as to whether it takes in enough of the river above the bridge to show the principal or larger part of Ackerman's island as it ever was, I would say no, I think not.

If Exhibit A–2 purports to be a picture of the Arkansas river at the Douglas Avenue bridge, as to whether it takes in enough of the river above the bridge to show what is or ever was the big end of Ackerman's island, I would say, no, sir. Yes, sir, in the left
6628 hand corner of the picture I see another trestle work starting across the river, and there is such a trestle or pile work across the river there now just above the bridge. I think there is, yes, sir. There was a bridge, I suppose it is there yet, on the Ackerman island about a quarter of a mile above the bridge. No, sir, the

picture marked Exhibit A–1 does not show enough of the island to show whatever is or was the big end of Ackerman's island.

As to the picture here marked Complainant's Exhibit A–52, shown me by counsel for Kansas, I would say that I don't know that that is a picture of any part of the Arkansas river or of cattle swimming the Arkansas river anywhere. I do not. As to whether the stream there represented is high or low water (objection), I should
6629 think that was rather just an ordinary—I wouldn't think it would be in flood. As to how I would suppose this tree over in the right hand corner would get the water up to the branches if it was just an ordinary flow, well, I was just looking. It looked to me like it was quite a space from there to the top—to the tree from the river. Yes, sir, I said the cattle were strung out considerably there, and it is pretty hard to keep them strung out like that in swimming any river. Yes, sir, that is my experience. Yes, sir, the greatest difficulty is that they want to bunch up and "mill" around. That is the greatest trouble, is to get them not to bunch up and mill. Yes, sir, aside from the toll, it is often easier to take cattle across the river in the water than on a bridge—a bridge like this. No, sir, the wild cattle like I handled in the early days are not easy to get on a bridge. Not much. I never tried taking them onto a ferry—the range cattle. I didn't want to. I should think it would be
6630 a hard job. Yes, sir, the cattle I forded in those days were Texas cattle, and I swum them across at the high time, in June. Yes, sir, there were other times of the year I could drive them across without swimming them. As to how I would bring cattle across at this time from the west side of the river to the east, at any time within the last two or three weeks, I would say, if we didn't have the Douglas Avenue bridge we would have to swim them, I suppose. Yes, sir, and I think it would swim them just the same today and for the last two or three weeks as in those days when I formerly swam them. I should think so from the looks of the river.

Yes, sir, if I started to throw a bunch of cattle in the river today I would expect to miss bottom somewhere before I got across. I certainly would. We have had quite a good deal of a flow in
6631 the river this year all spring, and this very last continuous run I suppose has lasted three weeks—something like that.

As to whether I ever knew any of the land owners along the river in my vicinity aiding nature in attaching islands onto their land, I would say, no, sir. I have heard that there was, but I don't know. I don't know about it personally, no, sir. As to what my observation has been in reference to the narrowing of the banks of any flowing stream, as to its effect upon the bed of that stream, I would say I think the channel would be deeper.

Recross-examination.

By Mr. ASHBAUGH:

Yes, sir, that is just a conclusion.

If today when the river is high you started a herd of cattle in to swim them across the river where I did in 1871, I guess you would run onto Ackerman's island finally, yes, sir, and on that part of the river instead of swimming them they could walk across today, yes, sir, part of it.

WINFIELD, KANSAS, May 12, 1905.

6633 A. J. SHORE, Winfield, Kansas.

Direct examination.

By Mr. MELVILLE:

I am forty-six years of age, and have lived in Palestine township, Sumner county, Kansas, during the last thirty-four or thirty-five years. The Arkansas river makes one line of Palestine
6634 township, and I live right up the river. I live within a mile of the river now. From 1870 when we settled up there to 1882 I think I was right on the bank of the river. I was raised, you might say, right on the bank of the river. Then there was about eighteen months, as near as I can recollect, that I was over in eastern Cowley county. Since then I returned back there and have lived ten years a mile back from the river, then I moved back immediately on the river bank and lived there five years, and then I moved back about a mile, where I now reside. Where I am living now we go about eight feet for water, and where I lived the first time, on land about a mile from the river, it was just north of there and I think about on the same level. Of course where I live now I have only lived about four or five years, but there it is about the same,
6635 and it is about the same level. On the home place where I first lived upon the bank of the river it was from nine to ten feet where the old homestead house was to surface water, and you would go to about the same depth now for water there. Yes, sir, I farmed these different properties myself and raised mostly corn. I have raised wheat and oats, but then my principal crop has always been corn.

Comparing the corn crops raised by me during the first ten years I was there with the last ten years, in the general average of bushels per acre, I will say I was small and didn't pay much attention to the crops then. There was somebody else to take care of me. We raise better corn crops, though, than wheat now, and I attribute that difference to the land getting more aged. It is as good in quality, I reckon, but it has been farmed so long that it don't raise as good crops. My theory is that new land will raise the best crops. That is my experience. No, sir, I have never
6636 had any experience in the way of fertilizing the land in any way so as to try and renew its virgin condition.

As to the crops raised by me during the period of 1880 to 1890 as compared with the last period, from 1890 up to 1900, in the general average of bushels per acre, I would say they would compare favorably, I think, and by that I mean about the same, to take each ten years in a lump.

Comparing the average crop per bushel for the last five years with the period from 1885 to 1890, I couldn't say. From 1885 to 1890 I was located just a mile back from the river. No, not where I am now. Upon the place just north of where I am now. Com-
6637 paring the crops raised on that land for a period of five years with the crops raised during the last five years on the adjoining land, I would say I don't think we had as good crops right in then as we are having now.

Yes, sir, I have been familiar with the river and with the amount of water in it during all these years, and as to my best judgment in regard to the volume of water in the river for the five years I was there as compared with the last five years (objection), I think it would be pretty much the same with the last five years that we have had. Comparing the volume of water in the river—and by that I mean not the highest or the lowest time but the general flow—for the first ten years as compared with the last ten years, I would say I believe, to take the first ten and the last ten, I think there was more water the first ten than the last, to take the ten years in
6638 a lump. Comparing the years from 1880 to 1890 with the last ten years, from 1895 up to the present time, I couldn't hardly fix dates on that. There was a period of low water and dry seasons that we have had, and I don't know just exactly when it was, but there was a period or two when the river ran low—two or three years maybe. Comparing the period from 1885 to 1895 with the period from 1895 to the present time, I believe there has been more water, maybe, in the last ten years than in the first ten.

Yes, sir, I have heard of the so-called underflow, and have heard it discussed, and as to whether this underflow has materially changed during the time I have lived along the river in Summer county (objection), I would say to take it back from the river, I don't think it has been affected at all. That is our observation in putting down wells. As to what I mean by the phrase "back from the
6639 river," I mean, I will say, when you get back either half a mile or a mile from the river, take it along the river, if the river comes up, for a ways back it will push back and seep up, but then we have put down wells there at any and all times and we have never seen any effect as far back as a mile. As to whether we have found any effects in the permanent change of the underflow, I will say, no, sir, I think not. I would think the height of the so-called underflow for the last five years is the same as it was in the period from 1880 to 1885.

Cross-examination.

By Mr. ASHBAUGH:

6640 I live in Sumner county, a mile west and four miles north of Oxford. I came to that county in 1870. I was eleven years old then. Yes, and we moved away from that place and was gone about ten years.

6641 No, sir, where we lived there along the river in 1870 we didn't dig any wells. I had some drove wells, yes, sir. As to whether we can tell by a drove well how deep the water level is, I will say we generally bore down until we strike water with a well auger before we put the pump in. Of course, as I said, I was then a young one and couldn't pay much attention right at that immediate time. My pump there is now down thirty-two feet. The man who put it down said it was eight feet below the surface when he struck water. As to how we can tell where the water level is, the only way is by dropping a weight down with a plumb line. I

6642 never did that, no, sir. No, sir, you can't tell after putting a drive well in, without taking the pump off and dropping a plumb line down with a weight on it, how deep it is to water, and that I never did. As to whether from my observation of the well and the use of that pump I know whether the water level remains stationary or whether it varies, I would say no, sir, I could not, I guess. There would be no way to tell that I know of. No, I personally did not put down a well in 1870. I was not in the well business then at all. I was not old enough to care whether or not there was a well. My father put the well down then. I couldn't tell how long that was used. We would take them up and put them

6643 down promiscuously, wherever we wanted one. Yes, sir, we always put those wells down deep enough to get a supply of water, and we were not putting them down to determine the level of the water, certainly not, and of course we couldn't tell, without taking the pump off and dropping a line down, where the water was. If the water level should change two or three feet I should think that it would make a difference in the pumping of the well. Yes, I think you would notice the difference if the water level was two feet higher at one time than another. I have noticed when pumps pump harder, but that might not have been the cause. It might have been

6644 the point filled up. As to the underflow being a fact that is universally known by the people along the Arkansas river in Sumner county, I will say, in the bottoms it is, yes, sir. We find it practically at the same depth at the same place, if we have cause to pump or bore down to get it. If the river has been high for a number of weeks, as to whether we find it nearer the surface than when the river has been low for a number of weeks, I will say, not to take it back from the river. In my observation I have never seen any difference in putting down a well back a mile. I have lived on the river bank a mile back from the river, whenever I have lived on the river. Yes, to take it within say fifty rods, if

the river stays up a period of a month or two it will seep
6645 back into the dirt. I would call that back water; I wouldn't call that underflow; but that recedes right back to the level of the river. Yes, sir, when the river is up the water level is up and when the river is down the water level is lower. If the river stays up of course it is as high as the river gets, and if it stays up it gets back a certain distance just the same as the level of the river, provided it is not in the clayey soil, and when the river is
6646 down it will be lower. I don't know how much the surface of the underflow varies, because I never paid any particular attention as to how much the river—it will go with the level of the rise of the river. The river varies in the time we have lived there. The highest I ever knew the river was right up to nine feet, and then the underflow—or the overflow—was back a good ways. It didn't have to soak back. The river would vary between ordinarily high water and low water. I should think probably seven feet. Not quite that much. Perhaps more than five feet. I think six feet would be a fair average. Yes, I think the underflow back as far as it is flooded from the presence of the river will vary a corresponding distance of five or six feet; that is, the back flow in the high water. Yes, sir, the water level along the river where the effect of the river is felt will vary five or six feet, according to the
6647 stage of the river. Yes, there are clayey substances and places along there where the underflow is not as perceptible as at other places. There is a difference in the soil—some clayey soil and some sandy soil—and the underflow is more perceptible in the sandy soil than the clayey soil. The clayey soil is fine, dense, solid soil and almost impenetrable to water. The clay is on the top of the sand, and if the clay for a certain distance would overlay the sand the underflow, I presume, might not be able to force itself up through the clay, although it might be down in the sand below it. Yes, sir, I have such clayey places as that. Yes, sir, at any particular place within a reasonable distance from the river the rise and fall of the underflow depends first upon the condition
6648 of the soil, and if the soil is sandy the underflow is perceptible, and if the soil is clayey it might not pass through it. Yes, the extremely high flood that overflowed the land was last July, I think. If there were two floods they came so close together we could hardly see that there were two. I couldn't tell how long they lasted. A couple of weeks, perhaps. Yes, the Arkansas river overflowed its banks at Oxford, on the east side, but not on the west. I should think that Oxford is twenty or thirty feet above the bed of the river—some*h*were along there. The flood came down the river from above. There was also a flood on the Walnut river in Cowley county that flooded Winfield pretty
6649 badly, which I guess ran right down through the streets of Winfield two or three feet deep. I understand it that way. Where I live I don't think the underflow has any effect during the growing season near the surface. We couldn't make any crops

without rain. I don't think it has any effect there (objection),
6650 and I don't think we got any good out of it. If the underflow was maintained throughout the season, I guess right in the immediate vicinity of the river it would help, in the very low places. I reckon it would seep up in the sandy places; that was all that I could see; but that would be right in the immediate low places. As to whether it would have any effect upon the crops under those conditions, I really don't know, but I think it would furnish moisture if it would be within two feet of the surface. (Objection.) There would be patches along where it would come within two feet of the surface. I should judge there are very few acres along there.
6651 I think there is very little farming land where the underflow comes within four feet of the surface. There are more places where it comes within six feet. Most of the farming land runs from eight to ten feet, though. Yes, we raise alfalfa down there. As to what effect the level of the water would have upon alfalfa, I couldn't tell anything about the alfalfa. I have never had any experience with it. As to corn land, if the underflow was eight feet below the surface I think it would be better than though it was six feet below the surface. No, I didn't say that the moisture would come from the underflow eight feet deep as much as though it were only two feet deep on precisely the same land, but I don't think you can have the same soil and have the underflow that close, because you can't have the depth of soil. As to whether land would be as
6652 productive in a year when the river is so low that the underflow is eight feet below the surface as it would be if the river is maintained right through the year so that the underflow is two feet below the surface (objection), I would say I don't know. It is never maintained through the year to hold it that way. Some times of the year it is that way and some times it is not.
6653 During the first ten years, from 1870 to 1880, I didn't pay so much attention to it then, you know. I was young. But then there was a good body of water in the river. Yes, during those ten years it overflowed its banks. Right east of Oxford it overflowed at that time. I couldn't be positive, because I wasn't there. During those first ten years, from 1870 to 1880, I presume I saw it every day, living right on the banks. I was raised right there. As to how wide and how deep it was, well, we forded it right along then and didn't pay as much attention as we have since. Sometimes we couldn't ford it, the same as it is now, and the same as it has been.
6654 Yes, I remember the flood of 1877. I couldn't say whether there was a bridge at Oxford at that time or not. We did some of our business at Oxford and some at Belleplaine. We went a good deal to Belleplaine. Oxford is nearer.

Yes, I remember the pontoon bridge across the river at Oxford. I couldn't tell when it was put there or taken away, nor how long it was. Yes, I heard of a man being murdered there. (Objection.) I couldn't say about a trial in Sumner county. I recollect hearing

about the trial, yes, sir. My recollection is that it was over the toll on the bridge that the man was shot. Yes, he had some difficulty over the toll. I couldn't say what year it was in. That toll bridge was a pontoon bridge. I recollect being there and having crossed it, but how long it was there I couldn't say. I crossed the river quite often and lived on the right bank and had to ford it at our place altogether, only we forded it when we could, and when we
6656 couldnt we didn't, and we used the pontoon bridge then to cross the river, I suppose. Yes, right there at Oxford the river a good share of the time was so we could not ford it. They didn't hardly pretend to ford it there, you know. The river is very narrow right there at Oxford. As to how wide it is, I couldn't hardly make a rough guess. It is just about as wide now as it was then, in my judgment. The banks haven't filled in perceptibly. I don't know. As near as I can see it is the same as it was, as to any made land along there. I don't know whether there is any made land or not. I think the flow of the river during the first ten years was just about the same as the flow during the last ten years, to take the two in a lump. (Objection.) That is my observa-
6657 tion. As to what I judge by, well, by the flow of water in the river. General observation is all that I can say that I took into view. As to whether we took the height of the river, well, I will say that is *the* all the way I could answer, just by the height of the river, yes, sir. (Objection.)

6658 The Ninnescah river flows into the Arkansas just above my place. No, sir, the Ninnescah river never went dry. No, sir, the Arkansas river never went dry at Oxford. I never saw it dry, and I never knew it to be dry there. If a witness for the State of Colorado testified that from 1881 to 1889, during those eight years the Arkansas river was dry three-fourths of the time at Oxford (objections), I should say it was not dry. That is all I could say. From 1881 to 1886 I never knew it was dry at Oxford to my knowledge. I think I would have known if it had been. Yes, Oxford is below the mouth of the Ninnescah, about two and
6659 a half miles. As to the water of the Ninnescah alone furnishing a flow in the Arkansas at Oxford (objection), if the river should be dry I don't think it would have furnished a flow—if the Arkansas river should be dry where the Ninnescah would empty into it. Oh, yes, the water of the Ninnescah all flows past the town of Oxford. No, the Arkansas river above the mouth of the Ninnescah never goes dry in Sumner county.

As to those clayey substances under the soil and how far back the underflow is perceptible in Sumner county, I will say, I live between the two rivers and there it is all the way. Otherwise I have
6660 had no observation. But out on either side of the bluffs, of course I don't know. I live between the Ninnescah and the Arkansas rivers. Yes, sir, the underflow in between those two rivers near my place is perceptible back to the Ninnescah.

Redirect examination.

By Mr. MELVILLE:

Yes, sir, I stated that my belief as to the underflow was based upon boring down to the surface of the water and sinking drive wells, and where I live now we would get water at eight feet, and at the different times we have put down drive wells it runs about eight feet. Where I was raised as a boy we went deeper there for water than where I live now, I should think about ten feet, out where the old homestead was. I don't know as I recollect
6661 of their ever putting a well down there when it was extremely high or extremely low. I never paid much attention to that only in the last few years. I haven't lived there. But when I did put down a drive well during these different years I have found water practically at the same place.

Yes, sir, I said if the river should rise from a minimum to a maximum of nine feet the water would rise and fall in this underflow nine feet. If it stood any length of time it would soak back. No, sir, I don't think that in sinking a well down eight feet on my place to where I said the surface water occurred, that if the river would rise nine feet the water in that well would rise a foot above the surface. I think not. What I meant in my answer was, in the immediate vicinity of the bank, is the way I understood it. When I stated that the underflow existed from the Ninnescah
6662 through the valley where I live over to the Arkansas river, my answer was based upon my belief and upon what I thought. It is a fact that we all drive our pumps and get the water all the way through. Yes, sir, we base that upon the fact that in sinking drive wells we come to the surface of the water all through that valley at practically the same depth, excepting there might be a rolling in the ground that might make a difference, and it was from that information that I said an underflow existed between the two rivers. Yes, sir, I have, in addition to hearing this water called the underflow and ground water and surface water, heard it called sheet water.

6664 W. G. CARSON, Winfield, Kansas.

Direct examination.

By Mr. DAWSON:

I live nine miles west of Winfield, Kansas, and a mile and a quarter from the Arkansas river. I have about 500 acres, and am engaged in farming, and have been engaged in farming there twenty-four years—since 1880, constantly. I do most of my trading at Kellogg and Oxford, and in going to Oxford I cross the Arkansas river, yes, sir. Yes, sir, I have thirty acres on the Arkansas river. The river is one boundary; and I have occasion from time

to time to go to that land, yes, sir. No, I haven't seen the
6665 river to observe it every week since 1880 as a general thing, but I have seen it quite frequently, and in seeing the river during these twenty-four years I have lived there I have had occasion to observe the flow of it, yes, sir. As to how the average flow of the river for the last ten or twelve years in my locality would compare with the average flow of the river there for the ten or twelve years preceding, I think there has more water flowed there in the last ten years. As to whether there has been as many overflow periods, and as to whether they have extended for as many weeks or months in the last ten years as they did in the ten or twelve years before that, I will say it averaged lower the first ten years.

My land is called bottom land. I go about eight feet to strike the water. Yes, sir, I have had occasion to dig holes—wells or
6666 openings—in the land during the twenty-four years I have lived there, and this has been done in different years and extending over the period from 1880 to the present time.

As to any change in the level of the ground water on my place in that number of years, I would say I have not noticed any, and if there had been any perceptible change I have had opportunity to and would have noticed it, yes, sir.

As to what effect the height of the water in the Arkansas river, that is, as to whether it is high or low, may have upon the level of the water in the ground under my land, I would say, not any.

I raise corn, wheat and oats, and the river has no influence upon these crops which I raise; not any. I depend upon rain. If we have good rainfall and seasonable rainfall we usually have good crops, and if the rainfall is poor, short or unseasonable, we have poor crops. As to whether the river is full or whether it is
6667 low, it makes no difference to my crops.

As to the values of lands in my locality at the present time compared with the values of lands in the same locality in the earlier years, I would say they are higher at present.

When land is constantly farmed in corn or in the same crop of any kind it will show a deterioration after a period of years, yes, sir. Whatever you manure you can see the improvement in crops of any kind. Making allowance for any natural running down of the land from constant farming, as to how our lands will compare now in productiveness with what they were twenty or twenty-four years ago, we don't raise so good crops as we used to, especially corn, and that is caused by the elements that make corn being used up—taken away in grain—because of the raising of crops on the land of the same kind, yes, sir. In my opinion that change in the soil has affected the productiveness of the land. That accounts for it, in my estimation. No, sir, there is no change in the water conditions either above the ground or below that has caused that running down.

6668 As to whether I ever heard any of the farmers in my locality before the commencement of this suit or before it began

to be talked about complain that the productiveness or value of their lands had been injured or decreased because of the river flowing less water or because of the sinking of the water level in the ground, I would say I never heard it spoken of at all.

Cross-examination.

By Mr. ASHBAUGH:

I live one and a quarter miles from the river, and most of my land is a mile and a quarter from the river. The farthest of my land is two miles from the river. The whole of my land doesn't lie along the river. I have five pieces, and just one is adjoining the river, I think it is thirty acres. That thirty acres is called
6669 first bottom. It is very sandy. That land would average about two or three feet above the level of the river, and right there on that land you can get water at two or three feet most any time. On that thirty acres of sandy ground it is not deeper to water at one time of the year than another. I haven't dug or found any clay on that. I never dug any well on that land, but just to get a drink of clear water I have spaded down, and I found water below there then. The river was just at a medium stage at that time. No, I never dug down there when the river was high. I never dug down there when the river was low. There was only one time that I remember of digging at all. The river was just medium then.
As to how I know that the water level under that thirty acres
6670 does not rise and fall (objection), well, that land overflows when the river is at flood. Of course I wasn't there then. The land overflows and is sometimes six or eight feet under water. When it is not overflowed and the river is low, as to whether it is farther to water than when the river is high, I say I presume right in the immediate neighborhood of the river it is shallower to water when the river is at flood. As to how far back that condition extends, I will say, as far back as that low, sandy land goes, perhaps a quarter of a mile. As to how much variation there will be in the level of the water under that land according to the condition of the river, I think it is much about the same. When the river is medium, neither in flood nor low, the water there is about the same. One reason that makes me believe that is that at the time I dug to get water to drink it was right within two feet, and if the river had gone down immediately after that and stayed down three months I guess you would have to dig farther for water in the immediate neighborhood. No,
that condition might not extend back under the whole thirty
6671 acres. Excessive rains would change the water level away back. I don't think the rain would affect it a quarter of a mile back. As to my ever having made any observations in that whole thirty acres excepting this one time when I dug to get water to drink, I will say, no, sir. I remember again fixing a fence along there and digging to water, and it was right there about the same

as at the first place. That was in the spring of the year. The river was just about medium. No, I never dug a post hole or any hole whatever on that thirty acres when the river had been low for some weeks. Yes, the river gets pretty low there sometimes, and below the mouth of the Ninnescah, and below the bridge at Oxford, about a mile and a quarter. That thirty acres has not increased
6672 in size, but has decreased lately because of the river. No, I think the land on the opposite side has not increased. My land decreased in this last flood of last year. That was the time it cut so much away. Yes, that flood was an excessive flood and overflowed that thirty acres six feet deep. There were two periods of that flood, and they lasted, I guess, about a week each time, and they were about a month apart. In taking the flow of the river into consideration I leave out that flood of last year. That was excessive. My land has been overflowed about three times within the last ten years. I couldn't say which years. It is not overflowed this year, 1905, but was flooded twice last year and once several years ago—possibly five years ago. No, sir, it was not
6673 flooded during the first ten years that I owned it. I bought that land in 1880 and have owned it ever since. I think the first time it was flooded was about five years ago—possibly about 1895. I couldn't tell. At that time it went over my land about a foot. I think the river is the same width as it used to be, just about the same, excepting this—that in them excessive floods some years the channel will come to my side. When it comes to my side it cuts away, and when it goes to the other side it adds on. As to whether it has added on more than it has cut away, I couldn't answer for only just the part of the river that is the boundary on my thirty acres, and I think it has cut off a little more than
6674 it ever did before. The river, I guess, is about half a mile wide. I guess in the fall of 1903 there was about an average flow of water, and in 1902 just about an average. In 1901 there was a pretty low season of water in there; I couldn't say just which year. The last five years of the '90's was just an average. During these last ten years, outside of the time when it was so high, I have waded across quite frequently there and it would be about two and a half feet where the water was running. That is below the mouth of the Ninnescah.

6675 Yes, I crossed the pontoon bridge at Oxford frequently. It was there in 1880 when I came. I couldn't say when it was taken away. Yes, I remember Mr. Hahn having been killed there. (Objection.) The quarrel was over paying toll for crossing the bridge. No, I don't remember the year in which the man
6676 was tried. (Objection.) There was a bridge built soon after the man was killed at the pontoon bridge. That pontoon bridge was maintained mostly by water. If any witness has testified for the State of Colorado that between 1881 and 1889 the Arkansas river at Oxford was dry two-thirds of the time (objection), I should say he was mistaken. I never saw it dry at Oxford. I

couldn't say whether the Ninnescah ever went dry. I never knew it to be dry. I don't think there are any islands in the river now that were not here in 1880. No, sir, I never saw any boats
6677 go up or down the river here. It has been told to me, that is all. That was before I came here.

As to what effect the rise and fall of the river has upon the water under this thirty acre of land that I own, I will answer, that I couldn't say, only as to the time I dug to get a drink and the time I dug post holes.

Land values are higher all over this country and everywhere around here, yes, sir. The country has developed. Yes, sir, there are better markets, larger cities and better railroad facilities everywhere.

No, sir, the thirty acres of land on which my farming oper-
6668 ations are carried on are not the thirty acres of land lying near the river. I never farmed any of that thirty acres. The land with reference to which I answered that the water level remained the same is the four or five hundred acres that I farmed and not this thirty acres.

6679 S. D. LEMASTERS, Winfield, Kansas.

Direct examination.

By Mr. GREGG:

I am a farmer and have been farming ever since I was big enough to work. I live in Oxford township, on the northern line. That is about seventeen miles from Winfield, and is a little north and west of here, and my land is between a mile and a quarter and a mile and a half from the Arkansas river. I have a hundred acres. My father preempted that in an early day. He took a claim in 1871, and I got it of him about six or seven years ago. Yes, sir, we lived on that land when we first came there, and I have been there ever since, with the exception of a little better than two years, when I lived a mile north and a mile west. But I have lived in that same neighborhood, in Palestine township, during all these years, yes, sir.

6680 Yes, sir, I have eighty acres of land in Palestine township, a mile north and a mile west of where I now live, and I also have a hundred acres in Oxford township, adjoining my township on the east. Yes, sir, I am farming 180 acres in addition to the farm of 100 acres which I own myself. Yes, sir, this hundred acres which I own is located between the Ninnescah and Arkansas rivers, on the bank of the Ninnescah. The Ninnescah is my west line. The hundred acres which I rent adjoins the Ninnescah on the east. Yes, that runs toward the Arkansas, and this 80 acres is a mile north and a mile west of the home place where I live. That is a little

farther from the Arkansas river. The Arkansas river I would
6681 judge is three-quarters of a mile from the east line of this 100 acres, and this land is a sandy loam and what is commonly known as bottom land.

Yes, sir, I see the Arkansas river every once in a while, and I used to be up and down it more or less in an early day, more so than I have of late. I have passed it and crossed it and been to its banks and am still living at this same place, yes, sir. During the last five years I have crossed the Arkansas river and am down to the banks half a dozen times a year or probably oftener. Yes, my neighbors, some of them, live on the Arkansas river right along the banks of it, and I had some relatives
6682 across up the river up to this last spring, and they lived across there about ten years, and I used to go over to see them frequently. As to the average flow in the first ten years I was on the Arkansas river, from 1871 to 1881, leaving out the high floods, as compared with the average flow in the last ten years, I couldn't see much difference in it. It is practically the same, so far as I can judge. Whenever I have been to the Arkansas river there has always been some water in it. I am speaking now of it about the Ninnescah. Yes, it used to get very low in those very early days, what we call very low. No, I never saw it run entirely dry. There was always a current. Yes, I have sunk wells on the lands in question, and I recollect the wells father put down. He dug two open wells on the farm, down to quicksand. They were
6683 twenty or twenty-five rods from the Ninnescah. They were open wells, dug with a shovel and spade, and we went between fourteen and fifteen feet to get to the first water level. We also had one that we called a box well that we used water from for years. That was on the opposite side of the house from the open wells, and it was the same distance to the first water. In the open wells there when we struck the quicksand we didn't go any farther. We didn't have anything to curb them with and didn't use them, but the box well we used the water from for several years. Yes, we sank those wells at different times. We made attempts to get water, and that was the outcome each time. In later years we have put down what we call drive wells, boring down to the water and then driving through the quicksand. Well, we couldn't see very well down to the water, but we could measure it, yes, sir. We
6684 found the water at those different times to be about the same.

No, sir, we never saw much difference in the variation of the open well. The others were never used. They were soon filled up. All the rest of the wells were driven wells. We would have to move our pumps there every few years on account of the pump filling up and the water getting so hard it was not fit to use; then we would move them. And that has taken place from year to year. No, sir, we found no change in the water level during those years. My experience is that it takes a fourteen or fifteen foot pipe to reach water. The last time I moved my well was three years ago. We moved

the pump, yes, sir. We bored the hole down first. Yes, sir,
6685 we could measure down to the water, and the water level was between fourteen and fifteen feet, the same as it was before. No, I never put any wells down farther over toward the river.

Yes, I have lived in that neighborhood sin-e 1871 and am quite well acquainted with all the farmers in that vicinity and up along the Arkansas river. As to whether I ever heard any complaint from any of those farmers in that vicinity prior to the bringing of this suit to the effect that their crops or lands were injured by the falling of this water level, I would say I can't call to mind any instance.

We raise corn, wheat, oats and a few watermelons on this land. Leaving out of consideration the wearing of the land by keeping the same crops on it for many years, our crops in the last few years as compared with the earlier years I think are about the same. I have noticed no material difference worth mentioning. In growing
our crops we depend upon the rain. My wheat crop last fall
6686 was fair. No, sir, we didn't pasture any of our wheat. We pastured last year, a year ago, and have had several falls lately that we have had plenty of pasture. We most always pasture our wheat land when we get any fall growth on it so that we can pasture it.

As to whether or not there have been any times when we have had lack of rain and still had high waters in the river when the waters helped our land, I would say, not to my knowledge. We never depend on the underflow or sheet water underneath for crops, and there is no one in our vicinity that does, to my knowledge.

As to the values of lands in these years as compared with the earlier years, I would say there is quite a change. Lands are worth
a great deal more now than they were years ago, and these
6687 values have increased several times and decreased and increased, but the last three or four years land has been going up pretty rapidly and the present values of lands differ. (Objection.) There are some quarters there that would bring $10,000, and from that to $12,000. No, sir, there has never been a time in the history of that country down there so far as I know that land values have been as high as they now are.

Cross-examination.

By Mr. ASHBAUGH:

At my place it is a mile and a half from the Ninnescah to the Arkansas, and I am pretty near the mouth of the Ninnescah, and nearer the Ninnescah than the Arkansas, and those wells I put
down were right near the Ninnescah. The Ninnescah always
6688 runs in the same course there. Yes, there are periods when the Ninnescah will run for weeks higher than for a similar length of time at a different time of the year. As to whether the

water in those wells changed at those times, I never tested them, only that one well I spoke of, the box well. I never noticed any difference. It took the same length of rope to draw the water at all times, and I judge from the length of the rope. Yes, the water might have been a foot higher at one time than at another, and I not notice it. Those wells are from twenty to twenty-five rods from the Ninnescah river. No, I have no wells down near the Arkansas river. I couldn't tell how far it is to water on my land near
6689 the Arkansas river. The nearest of my land is three-quarters of a mile from the Arkansas river. No, I don't know how far it is to water on any of that land that I either own or rent next to the river. I expect you might find it within ten feet; perhaps that would be an average. No, I never made any examination of the water level on that land down next to the Arkansas river.

Yes, sir, I have known of skiffs going up and down the river. (Objection.) In the early days I used to ride in skiffs up and down the Arkansas river. I have not had any lately there. I couldn't say as to others; I haven't seen any. Yes, others had boats
6690 on the river in the early days. Oxford is four and three-quarters miles below me. I do a part of my business there. I have crossed the old bridge there a few times. I can't tell you the exact date when it washed out. I think it went out in 1877, during the flood. Yes, sir, I don't know when that bridge was built, but not very long before that. After the bridge was washed out in the flood of 1877 they built a pontoon. I couldn't say how long it stayed. Yes, I recollect about a man having been killed there, and about the trial, but I couldn't fix the year. I never
6691 paid much attention to it. The bridge was there when that man was killed. (Objection.) As to what supported that
6692 pontoon bridge, I don't know. I never built it and didn't see it built. Yes, I crossed it. Yes, I believe there were pontoon boats in the water. As to the flow of the river in 1903, it was about as it generally is. I don't recollect any great variation in it. In some places it was ankle deep and in some places over your head, I guess. I didn't measure it. That is as good a definition and description of that river as I can give, in the fall of 1903. No, I can't tell on an average how deep it flowed, and can give
6693 you no information upon that. I couldn't say what the flow of the river was in the fall of 1902, nor 1901, nor 1900, nor during the last five years of the '90's. I couldn't state how the flow was on an average during the fall of those ten years. I couldn't state how wide it was, because it varies in width from place to place. I haven't been to Arkansas City for the last twenty-three or twenty-four years. I was up at Wichita a couple of years ago and went on the train. I couldn't see the river at all as I went up. There are a few islands along at my place. The river at my place looks about the same to me as it used to, or hardly so wide. I can't say whether any-
6694 body is getting any made land along there. I don't know that

I can see any more islands up the river than I used to. Yes, sir, there is some timber growing along there. When I saw those islands first there was some brush on them. I would rather judge that those islands get bigger during the dry part of the year and then wash out during the flood part. I never paid any particular attention to it, and not enough attention to state that as a fact. I don't believe I ever heard of their having a canal down at Arkansas City. (Objection.) I don't remember that years ago they dug a canal down there and ran their machinery by water power.

6695 (Objection.) When you dig a drive well you can't see down a two-inch hole very far, and we bore a two-inch hole and we can't tell the water level by looking down that. The object in putting down a drive well is to get plenty of water, and we never stop until we get plenty of water. We generally put those drive wells down eighteen feet; that insures plenty of water at all times. Our pumps are from twelve to eighteen feet. We aim to get the pumps below water so that they can suck water in place of air.

6696 I was never up the Ninnescah. I suppose what causes the fluctuations in the Ninnescah is rains. That is all that I would know at least. The Ninnescah has some rises in it when we haven't any rains at our place or any rains for a few miles above us. As to what causes that, it rains farther up the river. Reason teaches us that, yes, sir. I never was up there to see where the water came from, but that is what we supposed, that it was rain. There are times the Ninnescah is full at my place from what we call back water from the Arkansas. I don't know whether the Ninnescah varies in its flow past my place because of its supply from any original sources and not from rain. I don't know whether that is a fact or not.

Redirect examination.

By Mr. GREGG:

6697 Yes, sir, this pontoon bridge of which I spoke was put in for a money making scheme. That was my understanding. It was a toll bridge. Yes, sir, I spoke about using skiffs on the river, and by boats I mean skiffs. Yes, sir, it is a fact that there was not as many bridges in those early days as now, and these skiffs were often used to cross back and forth over the river. They were used very generally for that purpose, and there are now more bridges up and down the river than there used to be. Yes, sir, it has been my understanding that many of these islands or some of them along the Arkansas river where small channels had been between the islands and the mainland have in many instances been filled up artificially and attached to the land.

6698 No, sir, I should judge the river was not as wide at those places now. It wouldn't be quite so wide in respect to having that little channel cut off, no, sir.

Cross-examination.

By Mr. CAMPBELL:

The skiffs I spoke of were small concerns, propelled with oars. There were some that I would judge would be two and a half or three feet across at the widest part. They were used just for the purpose of crossing and recrossing the river. I can't say how long it has been since any of them were used. I saw one of them this morning when I crossed the Ninnescah.

6699 ERNEST C. MORRILL, Winfield, Kansas.

Direct examination.

By Mr. MELVILLE:

I live at Oxford, Kansas, and am thirty-eight years of age. I have become somewhat familiar with the Arkansas river as it flows through Sumner county by living on it from the spring of 1871 up to the present time. I have lived during this time from a little less than half a mile to a little over half a mile from it. My land reaches within 200 yards of the river bank, and the other land upon which I was raised reached to the river bank. I lived there on the land
6700 that borders on the river bank from the time I was six years old until I was twenty-four, and the balance of the time, lacking four years, I lived on the farm where I am now. For four years I was farther out from the river, about a mile and a half. During the time I lived a mile and a half from the river I probably saw it twice a month, and during the time I lived on the other place I would say that I saw it not longer than a week apart, and every day. Yes, sir, when I moved upon the river I was about six years old and the first six or seven years were put in following a herd, and from that time I followed the plow. When I was taking care of the herds I was on the river every day. I watered at the river.

From my knowledge of the river gained in this way, as to the average amount of water in the river up until 1880 from the time I can first remember as compared with the water in the river for the last ten years, I would say that during that time we had an uncommonly high flood. That was in 1877, I believe, to the best of my
6701 memory. Otherwise from that I see practically no difference. As to the average volume of water in the river during the ten years from 1880 to 1890 compared with the last ten years, probably there was more water the last three years; otherwise about the same. As to the average amount of water during the last three years compared with the average volume of water during any other three years of the time that I can remember, I would say the last three years it has been a great deal higher than in any other three years I can remember of with the exception of

1877, but the general average was about the same. We had uncommonly high waters in the river during the last year, from what they call the June rise up to the present time. Yes, sir, I was in position to observe the river particularly during that time. I was on the river all the time. Comparing the average flow of the river during that time with any other year except 1877, I would say that with the exception of the highest period of it it was about the
6702 same. I have raised principally corn on my farm since 1880, but some cane and sometimes some oats and potatoes.

I believe I am familiar with the kinds of land designated as first and second bottom in this country. The farm upon which I was raised contains both first and second bottom, and the farm where I am living now has first and second bottom lands on it.

No, sir, I have sunk of dug no wells upon either of these farms myself, but my brother dug two wells on the place I am now on. They were dug in the neighborhood of about sixteen or seventeen years ago, one a little later than the other. My brother dug two or three surface wells previous to that time. I saw them after they
6703 were dug. I might have helped to dig them, but I couldn't say as to that. That was between sixteen and twenty-two or twenty-three years ago. We went between three and five feet for surface water, and these wells were dug on the first bottom. What I mean by that is, low bottom, and the first soil was a heavy gumbo, with lighter soil on top, and then there was a blue clay, and then came sand, and then in the sand, there is where the water was struck. No, sir, we didn't strike rock or anything underneath going down in these surface wells. These wells were continued as surface wells in the neighborhood of three of four years and then as they didn't furnish the supply of water needed for the stock on the farm they were abandoned. Referring to the wells
6704 my brother sank about seventeen years ago, one of those wells on the first bottom is dug down about eighteen feet and walled up with stone. That stone rests on a slate-stone or soapstone. It may be termed one or the other. It is a soft stone. That well didn't supply the necessary amount of water then. It could be drawn dry with buckets in watering stock. Then it would be drilled eighteen feet down. Most of the way it was this soapstone or slate-stone. Yes, sir, this was on first bottom, and we would strike the first water at about five feet. This well was probably 200 yards over half a mile from the river. Since sinking that well down through the slate rock there has not been a scarcity of water. In regard to the other well, that is 150 to 200 feet farther from the river than the first one, on the second bottom, thirty-eight feet deep. This well was drilled and a galvanized casing put in. It was, I believe, in the neighborhood of twenty-eight feet long. The casing in this drilled hole serves to shut out
6705 the surface water, and the hole that extends on down farther to the bottom is thirty-eight feet. There is about twenty-eight feet of water in this well. Yes, sir, the total depth of the well

on the first bottom is twenty-six feet, and the total depth of the well on the second bottom is thirty-eight feet, to the best of my knowledge. Yes, sir, there is a well defined rise in the surface of the ground between the first bottom land at that point and the second bottom land between those two wells. The rise is in the neighborhood of eight feet. Yes, sir, I have a mode of determining approximately that matter. I have a stone well in the basement of my barn that is on a level with the top of the well at the barn, which is on the first bottom, which is on a level with the top of the ground at the house, for instance. Yes, sir, there would be eight feet difference between the surface of the ground of the 38-foot well down to the 36-foot well. That is, in the neighborhood of that. Right close to it. That would make a difference in the height on the surface between the 38-foot well and the 36-foot well of six
6706 feet. I believe that is about it. That is, there would be a fall going toward the river of six feet. And in the slate rock upon which the open well was placed there would also be some difference in the incline toward the river, but just what that difference is I couldn't say. But approximately I would say about six feet, yes, sir.

Yes, sir, I am familiar with the crops, not only those raised upon these farms I have spoken of but with the crops raised by my neighbors during this time, and I am familiar with the surrounding country in which I have been raised. Comparing the period from 1880 to 1885 with that from 1900 to the present year, in regard to the average in bushels of corn per acre raised in those respective periods, I would say I don't know as there has been any difference; and comparing the average in bushels per acre of corn during the last ten years with the average in bushels per acre during the time from 1885 to 1895, I would say that in the last three years there has been very little corn raised on the low lands. Up
6707 to that time there was scarcely any difference, one year with another. No, sir, there was scarcely any corn raised during the last three years on the first bottom land, on account of the overflow of the river. No, sir, there was no failure caused by the lack of water in the river. No, sir, I think not. The farmers in my community, including myself, depend upon the rainfall coming at opportune times to make a crop of corn. I don't believe I have ever known of any person raising a crop of corn with a high river when there was no rain.

Yes, sir, I am familiar with the bridge which goes over the Arkansas river near the town of Oxford. There have been two bridges built there. To the best of my memory, the first bridge was built about 1875 or 1876—somewhere along there. That first bridge remained but a very short time, because it had not been much more than completed when it was taken out by high
6708 water. A ferry took the place of that bridge, probably, first, and then the pontoon. The last bridge was built in the neighborhood of twenty years ago, but it has not the same number

of spans as the bridge first built. The first bridge, if my memory serves me, had two spans and an approach, and the second bridge three spans and an approach, but there is some distance between where each approach was located. The last bridge has three spans and an approach and the first bridge was above that. The last bridge I believe was first built with two spans and then later on another one added to that and an approach put out. That is to the best of my recollection. Comparing the straight portion of the river at this point, in width, as far as one can see from the river looking up and down, at the present time, with the time when the bridge was built, I would say I don't think that practically speaking there is any difference to amount to anything.

6709 Yes, sir, in the early days when I was there I knew of islands being in the river. Some of those islands that I first remember, a couple are gone entirely and others are formed in their places in the river. Comparing the width of the river generally and not speaking of particular places, at the different points where I am familiar with it through the country from the time of my earlier recollections to the present time, I would say the river is now wider, yes, sir.

Cross-examination.

By Mr. ASHBAUGH:

As to how far it is wider I couldn't tell you. I just judge by looks that it is some wider.

Yes, sir, I have been at Wichita and Arkansas City. I couldn't tell whether the river here is wider than it is at Wichita or Arkansas City. I was at Arkansas City about four years ago.

6710 (Objection.) Yes, sir, I have known of the canal at Arkansas City, and I knew of the mills, and of that canal being in existence. I didn't know that they had moved away, and I didn't know of their stopping on account of water, that is, I didn't positively know of it, but I have heard that they were stopped for lack of water. I was not interested in them. I do my business at Oxford, Wellington and Winfield, principally. I don't know anything about the river from Oxford to Wichita. All I know is in my immediate vicinity, four or five miles above and the same dis-

6711 tance below me. Yes, there is made land along there, and trees along the river now. There are more trees along the river than there were a few years ago. There are small trees on these islands.

The pontoon bridge was built after the first bridge was washed away in the flood of 1877. A ferry might have been used a little while, and then the pontoon bridge used to transport across the river. They didn't ford it, because there were times in the year when you couldn't ford it. That pontoon was supported by a wire or rope which I believe they ran across the river, and boats were built with lumber and those boats and the guy and the cable were

run across the river. The guy was used to keep the pontoon from floating down the river, and those boats rested on the water, yes, sir.

6712 As to the river in the fall of 1903, I don't know that I could pick out that year any different from any other. I suppose in the fall of 1903 there was about as much water as there was in the fall of 1904. The average through the months of August, September and October, 1903, was about the average of the years before. It varies in depth according to spots. It probably could be crossed by fording with a horse, belly deep, and maybe not in that same place the next day. It might be deeper next day. The river might have been deep for the four months named in 1903. Not clear across, no, sir. It varies, but belly deep in the deepest places, and perhaps fifty feet wide. It varied all the way from an inch to deeper. And I see no difference

6713 in the fall of 1904. The summer of 1904 was the wettest ever known so far as the flow of the river was concerned, but not the whole fall, only in the summer. I think the floods didn't come down as late as September or October. As to the Santa Fe tracks being washed out in September and October in Colorado, if I knew anything about it I have forgotten it. I might have read of it. I don't know anything about the Eden wreck in Colorado last year. I might have heard of it. I couldn't say

6714 whether there was any flood in the river about that time or not. Yes, sir, I had some experience with the flood in July, 1904. I lost all my crops. There were two floods so near together that you could hardly tell them apart. I couldn't say how long they lasted. The high water was during June and July. It was near the time that they held the Chautauqua assembly at Winfield. The flood that interfered with the Chautauqua assembly had nothing to do with me. The water in the Walnut emptied into the Arkansas river near Arkansas City, while I was on the Arkansas river, and the water in the Arkansas river didn't reach the Walnut river until it got down there, so I was above this flood water there. The

6715 flood in the Arkansas river was what drowned me out, and the flood that disturbed the assembly was in the Walnut river. Yes, sir, I was flooded in June, 1903. I was flooded some in 1902, but not so bad. I was not flooded in 1901. The flow of the river in the fall of 1901 was about the same as the average year. The last three years I have been flooded pretty badly, but before that I have not been bothered very much. Now and then a year we would be flooded. As to whether the rainfall is increas

6716 ing in this country, I should naturally believe it was. We are having more water than we were having before. Our river is higher than it has been heretofore, and I believe we have more rainfall. No, sir, I haven't examined the weather reports in any part of Cowley county. Yes, sir, I am troubled with floods on my lands. The banks of the river in my neighborhood are about

six feet high and the river at its lowest is about six feet below the bank.

As to how far the water extends back under my land, well, now, in low land the water is about four feet from the top of the ground. As to whether that rises and falls according to the condition of the river, I will say it does. As to how far back that extends, the farthest back is not quite half a mile that I have noticed it. It comes to the top of the ground. I don't know of it ever getting any depth above the ground, unless the river overflows, I have known it to come to the top of the ground. The gumbo I spoke of is on the first bottom, back farther from the river. That probably covers twenty acres. That gumbo is a black, heavy gumbo soil. I
6717 don't think water could go through that; not very well anyway. The clayey land is not soapstone or slate-stone, but is a blue muck of some kind, and is practically impervious to water. Pretty well so, yes, sir. If the water in the river should rise, I have never known it to go through that soil, and the rise and fall, where it does rise and fall, is only in such sandy soil as is impervious to water.

The first well I dug was about thirty-six feet deep, and the first water that we struck was in the neighborhood of four or five feet. That was 200 yards over half a mile from the river; and we went deeper to get an abundance of water. Those were the wells my brother dug. The wells 150 feet farther from the river were in the neighborhood of twelve to fourteen feet deep and we went
6718 down in order to get an abundance of water. I don't know that the level of the water in the first well was any higher than the level of the water in the other, but the land is higher that the well was dug on. I would think that the surface water probably was struck higher in the first well, farthest from the river, a couple of feet.

6719 As to how long the bridge was that was built in 1875, I never measured it. The ferry there was in the neighborhood of twelve feet wide. I think the ferry boat that was used would draw ten or eleven inches of water. I don't know how wide the river is there where the ferry landed. I couldn't say how wide the river was where the second bridge was built, either. Yes,
6720 they lengthened the second bridge; I presume it was on account of the amount of water that came through under the bridge, that they didn't have room enough. That is the way I lay it out. They had another span. I couldn't say how long the spans were. I have seen a high river there and no rains there, but I think there must have been rains somewhere when the river was high. No, I never knew any year in Kansas when there was no rain. Yes, sir, I have known years in Cowley and Sumner counties when there was not rain enough to make a crop. I can't state the years, but I have lost my crop on account of not getting water enough. That wa s about ten or thirteen or fourteen years ago. I don't remember

any particular difference between 1901 and the years before
6721 that. I couldn't answer positively whether there was rain enough in 1901 to mature a crop, but I think there was. In 1902 if you were on the uplands you would get water enough for farming; if you were on the bottom lands you would get a little too much. 1903 was wet. It was too wet for the bottom farms; and 1904 was a little more so. We had more water in 1904 than in either of these years mentioned, and I should judge we had more rain, and I connect the two. Yes, more rain more river and less rain less river. I don't know that we ever had too much river unless we had too much rain. The water on my land this 12th
6722 day of May, 1905, is pretty high. It is not flooded yet; it wasn't when I left there. There has been some seeped water in it within the last two weeks. We haven't had any rain to affect it in that immediate vicinity. I don't know whether there was any rain up the river in the State of Kansas. I have no understanding as to where this flood came from, but it is my opinion that it came from rainfall in Kansas. Yes, sir, the river at some times in the year when the pontoon bridge was put in there was not fordable, and the river is not fordable at that place now. In the fall of 1903 you could ford the river there. During the last twelve years I have never known a fall that you couldn't ford it there that I remember of.

6724 E. W. PHILLIPS, Winfield, Kansas.

Direct examination.

By Mr. GREGG:

I live about twenty-five miles from Winfield, Kansas. My post-office is Mulvane, in Sumner county. I have lived in that locality since October, 1870. I live in Mulvane now. That is about a mile from the Arkansas river. My lands are about three miles from Mulvane. My old home farm runs to the river. It has 160 rods of river bank. I preëmpted that claim in 1870, in the fall, and laid claim to it in 1871, in January. My business in the last thirty or forty years has been farming, and I am still interested in the farm and in farming.

6725 At the time I was living on the farm I was elected trustee in my township. I assessed the township for two years, and in the fall of 1880 was elected to the Kansas legislature from that 83rd district, and that district at that time covered all west of the Arkansas river in Sedgwick county, and that is where my farm is, yes, sir. I believe I live about half way between Oxford and the city of Wichita, on the Arkansas river.

As to my opportunities for observing the Arkansas river since 1870, I would say I have stock in my pasture there, and the watering privilege is on the river. I have a watering gap made at the river and am there frequently looking after that. Yes, sir, I have

seen the river, generally speaking, from week to week, since 1870, excluding periods when I was at the legislature. I have seen it at various times in each year since 1870, yes, sir. As to the flow of the water in the river for the last ten or twelve years as compared with the flow of the water in the river during the first ten
6726 or fifteen years that I knew it, I would say that I can't see any particular difference. It is about the same. There hasn't been enough change either one way or the other so as to make it materially noticeable. There have been extreme periods when it has been high and extreme periods when it has been low, but I haven't taken particular notice of it, of course, but as a general thing it is about the same.

My farm is bottom land. The first well I dug on it is half a mile from the river. The location where our house is built is a little bit higher, an acre or two, than the farm land that lies off in the bottom. The first well I dug was in a low place, a little ways from my log house, where I struck water at about eight or nine feet. I dug quite an opening and made dirt steps down to it and sank a box. We used that for only a short time. Then I dug a well near the house on a little higher ground, and I think
6727 that I dug down in the neighborhood of twelve feet, dug out a large hole, spaded it right out until I struck the water, and then I put down a drive well. I didn't bore it. I dug it out with a shovel or spade until I struck the water and then I drove the pipe in the water probably three or four feet. I can't remember the distance. And then I filled it right in around the pipes. I took the pipe out of that old well—I think the point got corroded or something wrong with it—in the spring of 1888 or 1889, and I dug a well about fifteen or twenty feet from that, a little lower down, and struck water. It might have been a foot or two shallower to water there than at the one I dug higher up near the house. But from sinking these two wells I didn't notice any material change in the water level. In 1898 I put the last well down. That well is in operation yet, and I didn't notice any difference in the water level then from the earlier years. I never thought anything about it. I struck water about the same. This was on lower ground, and I didn't dig quite so deep as
6728 I did for the first one. No, sir, there was not enough change if any to attract my attention. I raise different varieties of crops—corn, wheat, and I had a small crop of rye last year in one field—seventeen acres. I should say the majority of my land is about eight or nine feet above the water level of the river at ordinary stages. As to what I depend upon to make a crop on my lands in the way of water, I would say the seasons and rains, of course. I never have observed that the condition of the river, whether it be full or low, has had any influence on my crops, no, sir. If we have a season when the rains are poor or unseasonable we have a poor crop, and I can't see that that would be changed even though the river should be running quite a good, full stream.

I can't see that there is any difference. If we fail to have rain our crops fail.

Lands naturally deteriorate or wear out a little as they are continued from year to year in the same crops, and will not produce as
6729 much as when they are new. Making allowance for this natural deterioration, as to whether my lands are as productive now as formerly, I can't see any difference.

As to the values of land in my locality as compared with the values of the same land at any other time in which I have known them, I will say, the land has considerably advanced in price all through our section of the country. I have 160 acres of land there now. As to whether before the commencement of this suit or before the agitation just preceding its commencement I have heard the farmers there complain that their lands were being decreased in value or made less productive by reason of the drying up or shrinking of the river or the falling of the water level underneath the ground, I will say no, sir, I never have.

Cross-examination.

By Mr. ASHBAUGH:

Mulvane is on the line between Sumner and Sedgwick
6730 counties. When I was in the legislature I was living in Sedgwick county, about three miles from Mulvane. As to whether the river looks at Mulvane as it used to, I will say, about the same. As to whether it looks like an archipelago, I will say, no, sir. As you ride on the Santa Fe railroad from Mulvane to Wichita, as to whether the river is largely colvered with trees, islands, etc., I will say, at the different times of the year when the trees are all in full leaf of course you can see the water. I can't say whether there are more islands in the river now than there used to be between Mulvane and Wichita. I can't say that they are larger. I don't think there is any difference in the width of the river. I am sure I don't know whether it is as wide at Wichita as it used to be. I see by the papers they have been widening it. I never measured it. I haven't observed it particularly enough so as to judge whether
6731 it is as wide as it used to be. I couldn't say whether it is as wide today at Wichita or not. Yes, I settled here in 1870 and preëmpted my land in 1872. I used to go to Wichita once a month probably. During the early years when I was living on the farm on the west side of the river we crossed the river at Douglas avenue in Wichita. I forded it there before the bridge was built in the early days when I located here first, and I crossed it before that on the ferry. Yes, sir, I have seen them swim cattle across
6732 the river south of Wichita where they had the stock yards.

As to any island in the river when I used to cross it there in the '70's, I will say, yes, just below the bridge there was a little island there. It seems to me that the piers of the bridge were set

on some small islands there when that bridge was built, but I am not positive about that.

My land is first bottom land, yes, sir. The first well I dug there was in the spring of 1870, and I kept that well open only a short time. We didn't use it probably more than a month until I put a pump down near the house. I didn't keep it open to observe
6733 the level of the water, whether it changed or not, no, sir. Whether the water level under my premises there at Mulvane rises and falls with the rise and fall of the river, I couldn't tell you whether it does or not. No, I have made no observations to warrant me in stating one way or the other. As to the pumps I drove down, I couldn't tell the exact distance. The sand was filled in around the pipes and we drove them in the water three or four feet and I had no way of observing, and never thought, anyway, about it. As to whether I have had any way of observing and whether I knew whether the water level has changed under my land (objection), I will say no, only this well I dug in 1898, of course I didn't dig as deep to strike water, but it was on a little lower ground, probably a foot or two lower than the one I put down near the house. No, sir, I didn't keep any well open long enough
6734 to observe whether the water went up or down in that well according to the rise and fall of the river. As to whether I could tell from different wells as they were on different ground, I will say, I never noticed any in looking in, and never thought anything about it. I never paid any attention to it. Yes, sir, I stated on my direct examination that I thought there was no practical difference in the amount of flowing water. I said except those extreme periods. Of course we had high water in 1877 and high water, extremely high, in two or three years. I think in 1894 and last spring. I was not at home last spring, however, during the flood, but kept posted on the high water. My folks were writing to me. Yes, sir, this high water in 1904 flooded my premises. It was higher than in 1877. The flood in 1877 was not as high as it was last spring, because it ran over the bottom and drowned out seven or eight acres of corn last spring and it didn't in 1877. No,
6735 sir, my premises this spring of 1905 have not been flooded. No, the high water of one or two weeks ago did not come high enough to flood my premises. I don't know how much higher it would take to get the water over my premises. It has been pretty high this spring, but not nearly so high. It would have to be two or three feet higher to flood it. If the water had risen two or three feet above where it was this spring it would have seeped through some, yes, sir. By seeping through I mean where it is very sandy in the low places the water seeps up through this sand.

I have read about the underflow and have heard it talked of. As to how far back that goes from the river at Mulvane, I don't know. I couldn't say. Mulvane is situated on pretty high
6736 land. As to how far back from the banks of the river the high water which doesn't flood the surface affects the underflow

near Mulvane, I couldn't say. The underflow near Mulvane is anywhere from eight to nine feet, probably from the surface. (Objection.) As to whether that would affect a crop of alfalfa, I don't know whether it would or not. It seems to me from the length of the roots of alfalfa it would reach it all right. I have thirteen acres in alfalfa. I don't think corn roots would go quite so deep as that.

6737 My understanding of growing vegetation of that character, and wheat especially, is that it grows as deep in the ground as it grows out of the ground. I don't know positively about that. Yes, I think in general my soil is too far from the level of of the water to be influenced by it. So whether the water went up or down two or three feet under my land, I don't think it would affect the crop. If it was near enough so that the roots of the crop would reach it I presume it would affect it somewhat, especially in very dry times. I think there is such land as that along the river. Yes, sir, if the roots reached the water it might affect it if the underflow was a couple of feet down. If in one condition of the river the level of the underflow was three feet from the surface, I think that would be better for corn than though the river changed so that the level of the underflow was five or six feet from the surface. I never have farmed that kind of land. I don't know whether there is any

6738 underflow under that land or whether it is just the natural ground water that is found all over the plains country in the different States.

6739 MOSES NIXON, Winfield, Kansas.

Direct examination.

By Mr. GREGG:

I am fifty-two years of age, past, and a farmer by occupation. I am farming on the Arkansas river bottom, and have been farming all my life. I was raised on a farm. I own 400 acres of land near the Arkansas river. I settled on the northeast quarter of section eight. Yes, sir, I first had a quarter section of land. I located that twenty-three years ago last fall, and am still living on that quarter section and farming there. That is ten and a half miles from Winfield—two and half miles north and then west. I live two and a half miles east and half a mile north of Oxford, and I am on the east side of the Arkansas river. The first

6740 quarter section of land I got was three-quarters of a mile at the nearest point east of the river. That is bottom land—second bottom. The first bottom land runs back there about a mile and a quarter. My northeast corner of that quarter just lops off into low bottom a little. I have another 160 acres of land that adjoins that on the east, and 80 acres that lies south of Kellogg half a mile, and that land is about half second bottom and half hill land. We call that upland, yes, sir.

I have crossed the Arkansas river pretty nearly every week, I guess, sometimes twice a week there, during all the years I have lived there. Taking the ten years running say from 1881 to 1891 and comparing the flow of the Arkansas river with the last ten years, leaving out of consideration the floods, I would 6741 think the average flow would be about the same. There is not much difference, I think.

I am acquainted with most of the farmers up and down next to the river, and I meet them every once in a while. As to my ever having heard any of them prior to the commencement of this suit complain of the falling off of the water level under their lands so as to injure their crops or their lands, no, sir, I have never heard of it. I have never heard them say anything about it. I don't think there is much difference in the crops in later years as compared with the earlier years, leaving out of consideration any ground that is poor by reason of the crops grown. Yes, sir, we raise practically the same now as formerly.

Yes, sir, I know the farmers up and down there on the first bottom and have seen from time to time the condition of their lands, and I don't see that the crops on their lands are much different now from what they were in the earlier years. They are about the same. Of course some years are a little better and some a little poorer, and I think that depends on the rainfall. Lands 6742 have advanced in value in the last ten years as compared with the earlier years. The lands in that vicinity, including the bottom lands, have never been higher in value than they are now. Yes, sir, they are now the highest value they have ever been since I have been there.

Cross examination.

By Mr. ASHBAUGH:

I don't know how far it is to water on my place. I never dug a well; I have driven several of them. No, I can't tell exactly by driving a well how far it is to the water. I drive far enough to get a good supply of water. We want to get through the quicksand. That is what we generally drive for. Above the quicksand 6743 there is a little sandy or gumbo soil. No, not any blue clay, there where I am anyway. On the first bottom lands between my lands and the river I think you would strike water at about six or eight feet.

Yes, sir, I have heard of the underflow. I have heard them talk about the underflow that ran through there. As to how far back I understand it extends, why, they claim it used to extend clean back to that creek that runs through along the hill there. That is about three miles from the river.

6744 Yes, I think the crops are sometimes good and sometimes poor, and that is true on the bottom lands. If there was a year when there was not sufficient rainfall to mature a crop on these

first bottom lands but the river was full, as to whether they would raise a better crop than with the same amount of rainfall and the river being low (objection), I don't know about that, hardly. It might be that the underflow would supplement the moisture. I never farmed there on the low bottom to know. My experience is confined to second bottom lands entirely. I don't think we get any underflow on the second bottoms, at least I never saw that it helped my crops any when it was dry. I wouldn't say that the underflow does not help crops on the first bottoms that are near enough for it to furnish moisture. If there was not rain enough to mature a crop and the underflow did get near enough to the surface to
6745 furnish moisture, I suppose it would help it, yes, sir.

In judging of the flow of the river, I would not take into consideration the flood. It was just on a general average, you know.

No, I don't go to Wichita very often. I don't know whether the river looks as it used to between Oxford and Mulvane. I never went up the river between Oxford and Mulvane any further than up the Ninnescah.

Yes, sir, I have seen the pontoon bridge at Oxford, and crossed it many a time. They had the boats cabled up with a cable that ran across, and the water was under the boats. No, sir, I never saw a time when the river was dry at Oxford. I have never seen it dry here since I have been here, and I have been here twenty-
6746 three years. (Objection.) Oxford is below the mouth of the Ninnescah, and I never knew the Ninnescah to go dry. I don't know anything about the Little Arkansas; that is too far north for me.

Redirect examination.

By Mr. GREGG:

6747 If the underflow should come up to the roots of a crop and stay there for some time, I think it would injure the crop, if it stayed there. No, the land does not bake after the water recedes so as to hurt the crop, not unless it would be on top, I don't think. I don't know whether if it stayed close to the surface under the roots of the crop for a considerable length of time it would injure the crop or not. I don't know that it is true in some places where the water from underneath rises up to the level of the roots or very near the surface and remains there for some time that crops have been injured. I have never seen any crops injured along the Arkansas river by the water rising up there and standing there. Well, I presume maybe it hasn't stayed there long enough, perhaps. (Objection.) No, I don't know whether the water comes up to the roots of the crops or not. I am not posted on whether, to have any visible benefit, it would have to come about the right distance from the roots and then go away at the right time. Oh, I suppose part of the boats making that pontoon bridge rested on the sand, yes, sir, but most of them were in the water.

6749 G. R. HAMM, Winfield, Kansas.

Direct examination.

By Mr. MELVILLE:

I am fifty-three years of age, and I came here to Oxford, Kansas, in 1878, or three miles south of Oxford. Yes, sir, that is on the Arkansas river. Since I came here in 1878 I suppose I have seen the Arkansas river two or three times a week. There may be some weeks I wouldn't see it. I live a little west of the Arkansas river, about a mile and a half, and of course I couldn't see the river from where I live, but I go down probably once or twice a week, and some weeks I wouldn't go at all. Yes, sir, I am pretty well acquainted with the surrounding country and with the lands and the crops that are raised on the lands.

6750 I know where the bridge is located near Oxford, over the Arkansas river. It was not there in 1878. We then crossed on the pontoon bridge. As near as I can remember, this bridge was built a year or a year and a half after that—maybe two years. Yes, sir, I was pretty well acquainted with the river at the time the present bridge was put in there. As to the width of the river at that time compared with the river at the present time, I would say, I don't think there is very much difference. I don't see that there is very much difference in the average flow during the first ten years I was here compared with the different years during the last ten years, and I don't know as there is very much difference between the volume during the first five years I was here and that of the last five years. Of course the last year or two the

6751 river has been pretty high. I don't think I ever saw the river as high as it was last year, and I don't see that there would be much difference in the river during the various years from 1890 up to the present time, compared with the same number of years prior to that.

Yes, sir, I have heard of the so-called underflow, but I don't believe I know anything about it. That is something I don't know anything about.

As to the crops, particularly the corn crops, raised in the first ten years compared with the same crops raised in the last ten years in the locality in which I live, including my own, I don't believe there is very much difference. Of course there are some years better than others, and we have had it that way in the first years and we have it that way in the later years.

6752 I have seen islands in the river in the earlier days when I came there. As to whether or not those islands are there now, I would say I have seen them. It seems as though they are off at some other place; that is, they disappear in one place and come up in another, yes, sir. As to the change in the channel of the river in the way of land forming on one side and cutting out

on the other during these years, well, it seems as though it would cut out on one side and lodge in some other place. But as to the relative width of the river in the earlier years compared with the later years, I don't see much change.

Cross-examination.

By Mr. ASHBAUGH:

I can't see the river from my house; there is too much timber. I can see it before I get down to Oxford. About half way I can see the whole river. I live three miles south of Oxford, and when you get half way to Oxford there is no timber. No, you can't see the river from Oxford. You can see it just before you get there.

6753 The town of Oxford is back from the river about a quarter of a mile, and there is a very high bank between them. I don't think there was any dam ever put up there except at that mill. They have a race up there. I don't know whether they had a dam or not; I never saw any across the river.

In judging of the volume of the water, as to whether I judge by the height of the water in the river, I will say, I don't know, of course, about that. That might be. I never have much judgment about the water. Of course I see it sometimes too. The water is up sometimes and low sometimes. No, sir, I am not affected by the presence of the river at all at my land. It is thirty-nine feet to water at my place, and that is on the upland. So I have no occasion to observe the condition of the river because of any interest I have in it. I have rented land on the bottom and farmed there.

6754 That is all that I could tell about it, the couple of years I farmed some land on the bottom. That was four years ago and six years ago. I never noticed any underflow there, nothing more than what the rain caused. I don't know but there is just about as many islands as there used to be. It seems to cut out on one side and fill on the other, and then it would grow up a little timber—cottonwoods and stuff. I think the islands are as large as they used to be.

6755 HENRY HAHN, Winfield, Kansas.

Direct examination.

By Mr. MELVILLE:

I am fifty-seven years of age, and reside in Oxford, Kansas, at the present time. I have resided in that vicinity, except one year I was in Oklahoma, it is now twenty-five or twenty-six years. I have farmed all of the time, and I have been in the livery business for fifteen years off and on, but farmed at the same time. The first seven years I had a farm and a livery barn at Oxford and farmed this side a mile and a half from town about five years. During the

time I have been engaged in farming and in the livery business, as to how often, on an average, I have seen the Arkansas river in that vicinity, well, I couldn't say. I have crossed it every day twice for five years or nearly, twice a day or night. I should say it would average two or three times a week, I expect, putting it all together. For five years I crossed it every day twice. I didn't miss five trips, I don't suppose, in five years. It has been about nine years
6756 since I did any farming myself, and during the previous years I farmed off and on. I farmed all the time up to about eight or nine years ago, and I farmed on the bottom land. Part of it was first bottom and part of it second bottom.

Yes, sir, I am familiar with the river where the present bridge is built. No, sir, that was built after I came here, and I have been familiar with the width of the river there looking up and down the river as far as I could see during that time, and as to the width of the river at this time compared with earlier years, I couldn't see any difference. I don't think there is any difference on an average. The river banks have filled up on one side and cut away on the other during these years. There is a farm half a mile above town that has been cut off, an acre or two, and it has been filled in on the other side. The water cuts in against the bank, and I think
6757 it has washed off a couple of acres. I have crossed there when the wagon road was washed clear out about the length of this court house.

As to islands in the river during these years, I don't see any difference. They are only sand bars when the river is down. You can't see them this morning down at the bridge. The river raised last night. As to the general width of the river and its capacity to carry water in the later years as compared with former years, taking into consideration the filling up on one side and cutting out on the other and the change of the islands and the building up, there is practically no difference at all that I can see. It is practically the same.

I never sank any wells on my own land. I have had one on my farm. I had 100 or 240 acres of land that run up on the hill, I guess about fifteen acres of high land. My building spot was up there about thirty or forty feet, and my well I think was twenty-four feet deep—the open well. I had plenty of water in it during the five years I lived there. No, sir, I never noticed any rise
6758 or fall in that well when the river rose and fell. As to my having any general knowledge of wells being sunk on the first and second bottoms, I will say, on my father's farm and my brother's farm I know about what they said when they sank them. (Objection.) But from my own knowledge I never knew of anybody having to change a well to get water. I don't see that there is any difference.

When I was farming I raised the best crops when we didn't have the high waters, on the low bottom, and I raised mostly corn. We never had much wheat on the bottom. Yes, sir, I am familiar with

the crops raised around there generally during these years, with the exception of one year I was in Guthrie. I have been in the livery business off and on for sixteen years, and while in that busi-
6759 ness I have had occasion to drive teams over the country hundreds of times, and I have been in the habit of doing that, yes, sir, during all seasons of the year, and from my general knowledge gained in that way as to the average crops raised during the last five years as compared with the earlier years, as to the number of bushels of corn per acre, I don't see any difference particularly. They had wet seasons when there was too much water and they didn't raise hardly anything. It was too wet. Otherwise it didn't make much difference. And I think that average would apply to the last ten years as compared with the earlier ten years, yes, sir. That would be about my observation.

Cross-examination.

By Mr. ASHBAUGH:

5760 The first bottom lands extend along by Oxford, not quite a mile back from the river. That would be a fair average. On the low bottoms I suppose it is six or eight feet, somewhere along there, to water. I don't know exactly. I don't know how far it is to water on these first bottoms after the river has been down a long time. I don't know of any difference. I did put one well down in the basement of the kitchen once, but I don't know how high the river was when I put it there. I don't know how far it is to water on the first bottoms after the river has been full or up for a long time. I don't know that I would have any way of knowing that. I don't know whether there would be any difference or not. I couldn't tell you. The place where the well was put down that was twenty-four feet deep was a mile and forty rods from the
6761 river. The water didn't stand over two feet in that well. That was on the bench land about twenty feet above the water. No, I don't exactly know how high that is above the river bed. I never measured it. Of course I am not an expert.

I came here in 1880 as near as I can remember, and the pontoon bridge was in when I came here. It was taken out, as near as I can remember, about 1884. I can't tell you exactly. It might
6762 have been taken out in 1886, but I hardly think it was that late. Yes, sir, I forded the river many a time. It is hard to tell how low the lowest water was that I ever saw in the river after I came up here in 1889. I forded that river maybe one day in a week and maybe it would hardly be belly deep, and in three days it would come up pretty nearly over the horses' backs, when it hadn't raised a bit. The channel changed right there by the railroad bridge. I remember well that twenty-two or twenty-three years ago I forded that river one day on a pony weighing about 800 pounds and it didn't come up to her belly, and two or three times afterwards I went across and had to climb up on her back and

stand on my knees to keep from getting wet. That was before the bridge was put in. There was a pontoon bridge there. No,
6763 sir, that river was never dry at Oxford in the '80's. Yes, sir, I know where the railroad bridge is, of the Southern Kansas railroad. No, sir, that river was never dry in the '80's at the Southern Kansas railroad bridge. Yes, sir, it has cut out along the banks on one side, and how much it has filled up on the other, I couldn't say. The banks on the west side for three or five miles either way from Oxford are a great deal higher than they are on the east side. On the east side I wouldn't judge they were over six or seven feet, and on the west side they are pretty nearly thirty or forty feet, probably, right there at Oxford. Straight banks. As to how much it has filled up on the one side or the other I couldn't say. I was not on this side. In the other place I drove right along the road and could see the track where the bank was about eight feet right down. It just washed out. A neighbor or friend leased the farm and I expect he lost two or three acres of his land.

6764 JOHN THOMPSON, Winfield, Kansas.

Direct examination.

By Mr. DAWSON:

I live two and a half miles from Oxford, on the Arkansas river, and about a mile from the river. The land I am working runs to it. It is bottom land. I have been engaged in farming in that locality ever since 1878. Yes, sir, I have had an opportunity to observe the flow of the river since 1878 in a general way from week to week and month to month when we have high waters. Well, I saw the river every once in a while since 1878, and as to the amount of the flow of the water in the river for the last ten or fifteen years com-
6765 pared on an average with the flow of the water during the first ten or fifteen years I knew it, I would judge it is about the same. In the last few years we have had higher water. For the last ten or fifteen years it will average up as much if not more than for the same period in earlier years.

As to the general crops in the country in later years as compared with what they were in the earlier years, making allowance for the natural deterioration that comes from farming land twenty-five or thirty years, I would say there is not much difference.

As to whether before the commencement of this suit I ever heard any of the farmers in my section of the country complain that their lands were being made less valuable or less productive because of the drying up of the river or the sinking of the level of the water in the ground, I would say, no, sir, I don't know as I ever have. We depend on the rain for crops on the lands I farm.

Cross-examination.

By Mr. ASHBAUGH:

6766 I don't know as the river has any effect upon the land back as far as where I live. No, I don't mean to say that it don't have any effect on the low lands. It is twelve or fourteen feet to water on the land where I live.

Yes, sir, in judging of the flow of the river I took into consideration these high waters of last year. The land between my land and the river overflows, some of it. Yes, sir, it overflowed last year. The land I handle runs to the river. It has overflowed this spring on some of the low land, or it was overflowed a few days ago. That is from this same flood that is on now. There is a little made land along next to the river.

6767 J. M. BUFFINGTON, Winfield, Kansas.

Direct examination.

By Mr. DAWSON:

I live at Oxford, Kansas, and we call it ten miles from Winfield. I settled on the river in that neighborhood on the 25th day of April, 1870, that is, in Sumner county, and my land ran right down to the river. At the time I settled there there was no survey, and I had the whole of the river for twenty miles, but when it came to be surveyed it cut out a corner and would make over half a mile as it cut off a corner and made it more.

Yes, sir, I have been engaged and interested in farming lands in that locality ever since 1870, and am still interested in farm-
6768 ing lands. I have now 306 acres in one place and about 15 in another on the river. There is a tract of about 25 acres of that land that runs up to the river in two places. I have got a little over 1200 acres of land in the country around there, and I I think I have about 900 acres in crops this year. A little over that. Yes, sir, I live in the town of Oxford now, but I take a general supervision of these farming lands and overlook them from time to time. I have two sons, and the majority of the land they farm, and I farm some. Yes, sir, I am engaged in the stock business as well.

Yes, sir, I have had occasion to observe the Arkansas river since 1870 from time to time. We had a ford at my place up until 1880 when I left the farm, and we were backward and forward. Every-
6769 body crossed there, and I crossed it all the time. At a rough estimate I suppose there have been very few weeks when I was in the country that I have not seen the river, because it runs right up to the town, and my feed yard goes onto it.

From my opportunity of observing the river, as to how the average flow for the last ten years would compare with the average flow

during the first ten years, I would say a man is liable to forget, but it appears to me there has been more water in the last ten years than there was in the first ten. The average flow of the river for the last ten years is fully as much, I think, as for any other ten years since I have known it. I couldn't say there is much difference in the width of the channel in the locality where I live now as compared with the earlier days, from the fact that in some places it is narrower and in some places it is wider, but I don't think there is very much difference.

There is a little place right at Oxford there that I made a dike to go to the pontoon bridge that makes the channel a little narrower. That is the only place I know of where it has been narrowed by the efforts of man. The Arkansas river in that locality shifts
6770 more or less all the time. It frequently cuts out on one side and builds up on the other. (Objection.) And that has been true more or less ever since I have known it.

Yes, sir, I have had occasion to sink wells for water on these lands I have owned, a good many times. This land was bottom first, and there has been more upland than bottom land. I own more upland than bottom land. Yes, sir, I have sunk wells on the uplands a good many times, and did so in the earlier days, and have done so in the later years. So far as I have been able to observe, I never could see any change in the level of the ground water underneath the soil—the first water—during those years.

6771 There have been two pontoon bridges at Oxford—one above where the main bridge is now and the other right at the main bridge; and before there was any bridge in that locality we all forded or swam the river. Yes, sir, there were lots of times when it would swim a horse, and there were lots of times when you could ford it without swimming a horse. And if there were no bridges now in these later years I suppose it would be the same way. If it was up we would have to swim it and if it was down we could ford it. And in the last week or two or three we would have to swim it, I think, all the time. Yes, sir, there was a ford there before they put in the ferry, and then they put in the ferry. But the ferry only ran part of the year. It was a toll ferry, you know, and of course when they could ford it they forded it. The first bridge after the ferry was a pontoon bridge. I wouldn't be positive as to whether there was a permanent bridge built before the pontoon or not. I
6772 was not living in the town at that time. No, the first bridge that was put in was put in in 1877 and only stayed in a short time, and then they put in a boat, and then the pontoon. Yes, sir, that was a permanent bridge in 1877, and that went out, and then the pontoon bridge was put in after a little. I think about 1880 the pontoon bridge went out. Yes, sir, the pontoon was a toll bridge. The reason the pontoon bridge was put in after the first permanent bridge went out was that it cost too much to build a bridge and the county wouldn't build it and there wouldn't any individual put

in that much money to build it, so that they had the pontoon.
6773 Yes, sir, I became interested in that pontoon bridge. There was a company of us bought a half interest in it. And that was used either four or five years, and after that they put in the bridge that is there now. No, sir, I don't remember whether the bridge there now is as long or longer than the first permanent bridge that was there. They are about a quarter of a mile apart. We don't notice much difference in the land that has been farmed a number of years in the same crops as to its running down. It would run down in some spots. Outside of any natural running down that there might be from farming land for a number of years, as to how the land in the vicinity of Oxford would compare in productiveness now with what it was twenty-five years ago, I would say I don't see much difference. New land will naturally produce a little more. If you plow up new land now it produces a little more.

The market values of lands now are the highest they have ever been.

In raising crops on the bottom lands along the Arkansas river we depend upon rainfall, of course. As to the river having any
6774 influence upon a crop, I would say it had quite an influence last year. It washed out a couple of hundred acres. And as to whether it had an influence when it didn't overflow, I would say the water will sometimes rise up in low places until it gets so close, and in fact it will rise in low places until it will stand on it, and that drowns the crops out, of course, in the low places. But outside of the low places or sloughs on the general farming land I don't see that the water level has much influence on the crops, if any. Yes, sir, running through the bottom lands up in that country there are several sloughs or depressions that have the appearance of being old channels that the river might have occupied in the earlier days, and these are the kind of places that one notices the water rising in when the river is high, yes, sir. When the river is running a fairly good stream, up near the top of the banks, but not overflowing, and we didn't have any rainfall during the summer, as to what kind of a crop we could get in those bottoms, we never have that kind of a year, and so I couldn't say. When the river is
6775 running low and we have good and seasonable showers and good rains we have good crops, of course.

Yes, sir, I am acquainted with nearly all the farmers through that section of the country about Oxford. I know all their names. I know every man in the country, and I guess they all know me. I am sixty-one years of age. As to whether before the commencement of this suit or before the agitation just preceding its commencement I ever heard the farmers in my locality along the Arkansas river complain that their lands were being made less valuable or less productive because of the drying up of the river or the sinking of the underflow in the ground, I would say I never did, no, never.

Cross-examination.

By Mr. ASHBAUGH:

There is part of the time I didn't own any bottom land at all. Right now I am farming in the neighborhood of 250 acres that is on the bottom. As to how deep the water is there now, I will say, right at this time it runs from—I expect there are places it wouldn't be more than a foot deep to water, but there are places it is
6776 eight or ten feet to water. Yes, sir, on an average the water on this land is from one to eight feet below the surface when the river is high. The river is the highest I have ever seen it when we had no rain, right now. I think the river is now about five or six feet above the low water mark. That would be my guess. On this land, as to how deep it would be to water after the river has been low, I would say anywhere from six to eight or twelve feet—along there. As to whether the water under that bottom land varies in height about six feeet, I would say it varies just as much as the river rises and falls. As to how far back that extends, I will answer, it runs back as far as this first bottom goes, and there are places the river runs plumb to the banks—to the upland. It will hit the bluff, and then there will be a mile—I expect there are places it is a mile—right across my land. There is one place that it must be considerably over a mile. Yes, there are places down there where there are no bottom lands, and there are other places where the bottom lands are about a mile wide. I should say that the first bottom
6777 lands along there would average about three-quarters of a mile wide. Yes, sir, under that first bottom land the water rises and falls according to the condition of the river. I am positive of that. On this first bottom land, if the rainfall should not be sufficient to raise or mature a crop but the river should be high, but not so as to overflow, as to whether we would raise more than though the rainfall was just the same and the river was low all the year, I will say, I couldn't answer that question, for I have never seen it dry. When the weather is very dry the river is always very low; and the contrary is true, except right now it is getting dry on the land but the river is high. I have never seen it that way before. I don't know whether the present flood is a flood from rainfall in the State of Kansas or not. There has been no rainfall near
6778 us. I understand there has been some rain in Kansas, north. As to whether that bottom land would be as good, taking it year in and year out, with our present rainfall, if the river was low all the time as though the river were at a medium height all the time, I will say it is a matter of opinion, but my owning land as I do, I would like to see the river low all the time, because I don't want it to overflow. We got it heavily last year, and the flood of last year in respect to my crops necessarily would be in my mind all the time. We would naturally think about it. The farm I owned in 1877 just touches the farm I now own, and I think the

flood was a little higher in 1877 than it is now. I am posi-
6779 tive it was on that side of the river. As to the flow of the river in the fall of 1903, I have nothing in mind that I can just think of. In the fall of 1902 it was low enough so that we rode backward and forward across the river all the time. As to 1901, there were times in the fall that we couldn't, but there were times when the river came up like it is now. I wouldn't say like it was in the spring, but I know I rode across the river lots of times. Probably the fall of 1901 was pretty dry, but we had water there. I won't say. I wouldn't say how the flow of the water was in the river in the fall of 1900, because I don't remember that exactly. As to how the flow of the river was during the whole of the fall of each of the five years from 1895 to 1900, I will say that I at that time didn't own land on the river and didn't know as much about it. I have only owned this piece of land I own on the river now since two years ago last fall, and that was a dry fall two years ago.

When I spoke about the water for the last ten years equalling the water for an equal number of years in the earlier period, as
6780 to whether I had in mind all the time this high water of last year, I will say, no, but going backward and forward across the river. I forded backward and forward across the river all the time. I think the water was higher in 1877 than it was last year, and what I had in mind as to those ten years was the average. As to whether I had prominently in mind the high water of last year, I will say, no, not particularly. I was just thinking about the times I had crossed it backward and forward. Oh, yes, I did have it in mind. I would have to think about the high water of last year and the high water of 1877; and the water in 1874, the grasshopper year, was the lowest I ever saw it. Oh, no, it didn't go dry at Oxford. The river was never dry. I have waded it back and forward with my boots on lots of times and never got it over my boots. No, I can't see any difference in the length of the dry periods or low water.

6781 There are some years, of course, it is not as long as others. Last year we didn't have much water at all. I frequently go to Arkansas City. I drove by their canal in going to Arkansas City, but I have been to the mill very few times. I cross the canal in going there. That canal is used now. The water flows down through it right now. It did the last time I was there. I don't know a thing about whether they have a — sufficient supply of water to run their machinery for the ten years prior to 1904. That is out of my range entirely. I have land close there, and crops in there, but once is the only time I ever had anything to do with the mills. As to whether a supply of water in that canal so as to run the machinery would be a pretty good test of the amount of water in the river (objection), I suppose it would. That would be my opinion. But I know nothing about it.

6782 Yes, sir, there were two pontoon bridges here. The ice took out the first one. The river was frozen over. I think

that was in 1880. During the years 1880, 1881, 1882, 1883 and 1884 I would say, just guessing at it, that you could ford the river about half of the time, and then there are times that you can't ford it on account of the ice. I was thinking of that also at the time I spoke. I don't know how much of the time you could ford the Arkansas river during those years because of the amount of water that there was in it. A great deal of the time. Perhaps there would
6783 not have been more than three or four months but what you could have forded it during those years. It is somewhere near correct to say that you could ford the river half of the year. During the early days we forded it all the time, but when we had the bridge in of course we could cross on that. The pontoon bridge was built on boats, and finally I put in nine boats under it and put timbers on from one boat to the other. Those boats were thirty feet long and ten or twelve feet wide. I believe that bridge lasted until 1885.

No, sir, I never saw any boats coming up or going down the river. I don't remember seeing any work done here by the Government officers along by Oxford. I understood there was some Government expert on the river, but I don't think I ever saw him.

6784 In places there is made land along the river, and in other places it has washed out. I have no way of knowing whether it has washed out as much as it has filled in, but I would say there wouldn't be much difference. The river is wider in places and in other places it is narrower, and I would say it would average just about the same. There are sand bars—islands—in the river here. On most of them the timber is cut off and some of them are gone. Some of them are there yet. I know of one little island that
6785 has attached itself to the mainland, and that is the only one I know of that has become attached.

Yes, sir, I have been in Wichita lately. I had no chance too see the river below Wichita except on the railroad. In one sense of the word, the river between Mulvane and Wichita don't look like it used to, for it used to be covered with timber on the banks, and there is none there now; but just riding along and looking at the water, I can't see any difference. I don't know anything about how it is between Mulvane and Wichita. I ride up and down on the trains and never pay any attention to it, and have not a very clear idea of how it looks. I don't really think everything has gone up in this country. The country has developed more than it
6786 was twenty-five years ago. Yes, we have better markets and better railroad facilities and the general development of the country is greater.

Redirect examination.

By Mr. DAWSON:

So far as the amount of water flowing in the Arkansas river is concerned, I don't think I see any difference between it now and in

the '70's and '80's. You couldn't ford it now at all. (Objection.) Yes, I think it could be forded as many months out of the year in the '70's and '80's as it could be during the last fifteen years. I think it could.

Recross-examination.

By Mr. ASHBAUGH:

6787 I have never seen but very little difference at any time from 1870 up, but only just the dry and wet seasons. I don't think it changes. The longest low period that I ever saw was in 1874—the grasshopper year. My memory can't count all the particulars for the ten years. I just take it as a general thing.

Cross-examination.

By Mr. CAMPBELL:

6788 Excluding the flood periods, I think there is very little difference in the average flow of the river during the last ten years from the average flow of the river during the first ten years I knew it, except one year it was so very dry, and then it was lower than it ever was, and a longer dry spell.

6789 L. H. HILL, Winfield, Kansas.

Direct examination.

By Mr. MELVILLE:

I am sixty-one years of age, and I came to Oxford or in the vicinity of Oxford in February, 1870, and stayed there about three months and went to Eldorado and stayed there until the next spring when I came back again and stayed at Oxford until the next spring. I preempted land there, and that was my headquarters until the spring of 1874. During that time I had ample opportunity to see the Arkansas river, by fording it, because there were no bridges. In a general way, probably I crossed the river during those four years once a month, taking it as an average, for four years. I afterwards returned to that vicinity, in April, 1889, and since that time
6790 my home has been in Oklahoma. During that time I saw the Arkansas river probably on an average enough to make once or twice a year or something like that, up to the present time. A year ago last August I came to Oxford, and that has been my home ever since. I have not been gone probably more than a month or six weeks at a time since a year ago last August. I came there in 1903. During this time I saw the river two or three times a week and sometimes every day. During the first three or four years I was here in the '70's we had very high water. I happened to be here at the time. At the high water of last summer I was not here, but

I was here soon after and saw the effects of the high water, but outside of that I should say the flow of the river so far as the looks and general appearance go would just about average up with the first four or five years I was here, with the exception of the high water. But the high water of last summer—of course the land was pretty much all in cultivation on the low land and it probably made
6791 a bigger showing in the way of the destruction of crops than it did in the first high water.

After being gone sixteen years of course the old Arkansas looks the same, except that the farmers have put out trees here and there and as I ride along on the train I can't see the river quite as well as I could in the first place. But after I got up there at Oxford everything was perfectly natural everywhere I went, and it is today just the same as then, except out in the bottom there are big trees where there was no timber before. The river looks as it always did. In February of 1870 I crossed the river two or three times on horseback. The water was probably two feet deep in the deepest place, and it seems to me it was just about that deep last fall, just about the same depth at the deepest place. The river in some way rises up and drops down and drains off and gets very low. It always did, and has the same habit yet as far as I can see.

Cross-examination.

By Mr. ASHBAUGH:

6792 I never crossed the river except on bridges in 1903, and then not more then three or four times, because I came here the first of August. I saw the river in 1904 perhaps thirty or forty times, maybe. As to comparing the first four years, from 1870 to 1874, with the year 1904 and thus far in the year 1905, I will say, in 1903, the latter part of the summer and the winter, and from there up to today, the comparison is just about the same as far as I can see. There was one high water during that time and there
6793 is one high water during this time. Yes, sir, that is as far as I can say—that the four years from 1870 to 1874 would compare in flow with the water in the river from August, 1903, to the middle of May, 1905, and in the intermediate years from 1874 down to 1903 I didn't see it often enough to give a fair comparison. What I was trying to tell you is that the river looked just the same—about the same habits and about the same amount of water when I came back to this country from New Mexico as when I went away. There would be low water, and then it would jump up again. It is the same old creek. As to the average width, I wouldn't want to give my judgment under oath in a matter of that kind. I didn't measure it, but as far as looks go it is the same old creek. It looks as
6794 wide as it ever did, so far as that is concerned and I can't say it looks any wider. There is about four times as much timber around Oxford as when the country was settled—planted out trees—and some of the second growth trees are bigger than any of the old ones.

Redirect examination.

By Mr. MELVILLE:

Yes, sir, comparing the period from 1870 to 1874 with the last four years, it is my impression it is about the same. Last
6795 summer I was absent during the high water, but I saw the effects of it when I came back, so I am taking into consideration the water as I saw it in making that comparison. Yes, sir, that is right. Well, of course I have been gone a good while and have looked at the river a little bit more, probably, than though I had been living on the banks and seen the creek every day. In fact I like the Arkansas river; it looks like a good place to live and a good place to be, and of course I have noticed the river the first thing when I came back and when I came down here in 1889 I would have to go down to the bank of the river and take a look at it, and I simply get like you know a man naturally will, and I wanted to see all I could when I was here, for I was getting gray when I came back, and I noticed it on that account. I know at one time I was crossing the bridge at Arkansas City and remarked that the Colorado fellows were gettting all the water.

Recross-examination.

By Mr. ASHBAUGH:

6796 Yes, it looked at the city of Wichita last year like it used to look. I couldn't see any difference. I crossed the Douglas Avenue bridge two or three times in the last three or four years. I couldn't see any difference. Sometimes it was up, a good stream, and sometimes it was low.

6798 JOSEPH HAHN, Winfield, Kansas.

Direct examination.

By Mr. GREGG:

I am a farmer and have been ever since I have been a man. Yes, sir, I farm in this county near the town of Oxford on the east side of the Arkansas river. There is about 210 acres of land in that farm, and I have been there ever since 1879. It is first and second bottom lands. In 1879 there were 43 acres of land in that tract and it was about half of it what I call first bottom land. The rest runs out on what I call second bottom. This farm was about
6799 43 rods, I guess, from the river. The balance of the land is back on the second bottom; that is, what I call second bottom. I guess it is about eight feet higher than the first bottom. I shouldn't think that first bottom land was over four or five feet higher than the surface of the land in the bed of the river, and it is about three feet to water on the lowest part. It would average about

five feet over that land. We raise corn there mostly. I have farmed that ever since 1878 nearly every year—or 1879.
6800 The first crop I put in was in 1879, and I have raised that kind of crop from that time until last year. That land never overflowed on me until last year. No, sir, I wasn't there when the Arkansas river was so high in 1877.

My house is about 80 or 90 rods from the river. There is just a little fraction in between there. I have 43 acres, and I think the other man calls his about 35 or 45 acres, right next to it, and that takes us right to the river. It would be approximately half a mile. Oh, yes, I have seen the river often during these years. I have seen it every once in a while from 1879 to the present time.

As to the flow of the Arkansas river, taking the average flow during the first ten years I was there and leaving out of consideration high floods, as compared with the last ten years, I should judge it was about the same. I couldn't see much difference if any; and I would say the same during the other ten years I was there.
6801 As to whether my crops have been as good during the last five to ten years as during the earlier days, I would say they have, yes, sir.

Yes, sir, I am pretty well acquainted with the farmers out in our community, but only just in my own neighborhood. Yes, I know them up and down the river for a mile or two on each side, and I have known them since the early days. As to whether or not I ever heard any of those farmers complain that their crops had been affected or hurt or their lands injured in any way by reason of the water level falling underneath their land, I would say, no, sir. As to the value of lands now compared with earlier times, I would say it is big. They have never been higher than they are now, no, sir.

Cross-examination.

By Mr. ASHBAUGH:

6802 I have heard of Colorado taking the water out for irrigation. I have heard it talked among the farmers and papers and one thing and another. I have heard them say they were taking the water out up there and using it for irrigation. In places the water under the first bottom lands that I have been farming is a couple of feet and in places four or five feet deep. It is not level exactly. I expect it would average five feet to water; that is, it would average from two to seven feet. Yes, sir, it is deeper
6803 to water on my land at one time of the year than at another. As to when it is deepest to water, I will say, whenever the river rises the water rises, and it falls with that. Yes, the water level under the second bottom land rises and falls with the rise and fall of the river. (Objection.) When the water level is nearest the surface as to whether there is more water for the growing of crops if the rainfall should be too small for a good crop than when the water level is low, I will say, it does

sometimes and sometimes it doesn't. It is according to how close it comes up. If the water comes too close it does you an injury and if it gets too low a little rainfall will help a little, I judge. I have never had much experience on that, only on the little bottom land I have got. I never knew much about it. No, I don't think
it would be an injury if the water level came within two
6804 feet of the surface. It would be pretty hard for me to say
that if the water level was high but not nearer than two feet it would be better for a crop of corn than though the water level was farther from the surface. I don't know. No, you can't raise a crop without moisture, but we generally want the moisture from above. No, we haven't always had moisture enough from above. During the dry years if the river remains up and consequently the water level under my land remains up, as to whether my crop is better than though the river was dry or low and the water level was low, I will say, yes, sir.

Redirect examination.

By Mr. GREGG:

The water level rises gradually when the water rises in the river. If the water rises until it comes up to the surface and makes it wet all over it is an injury, and if it stays close to the roots and stays
there quite a while, that is an injury, and if it gets up and
6805 stays over the surface, that is an injury; so that to get much
benefit out of it it would have to get to the right point below the roots and then go away at the right time. That is the way I would judge. No, sir, I don't know of any good crops raised on this lower land at any time unless we had fair rains. I have found those rains necessary in order to mature my crops, whether it is on first or second bottom. That is the way I have always found it.

Recross-examination.

By Mr. ASHBAUGH:

The water level since 1875 has never been so near the surface on my land as to injure a crop, where I live, but it has on other bottoms. No, sir, I haven't been expressing any opinion about any other lands than my own. Yes, sir, it ruins a crop if it overflows
and the water stays on for a long time, and I have been in-
6806 jured by a flood over there within the last year, yes, sir, and
on all of my bottom lands. No, sir, I don't want to do anything intentionally to increase that flood nor to have any recurrence of such a flood as that of last year.

Cross-examination.

By Mr. CAMPBELL:

I don't know how high the river has to get before it affects what I call the underflow or underground waters. The river is pretty high now. It has not affected my part to amount to anything.

6807 A. D. PENNINGTON, Winfield, Kansas.

Direct examination.

By Mr. GREGG:

I am a farmer, and was raised on a farm, and have farmed all my life since I was big enough to work. I am living six miles northwest of this town, in Vernon township. I move around a good deal. I moved from ten miles east of this town to where I now live. Yes, sir, I had some land on the Arkansas river. I came to Cowley county in 1871. I lived on the Arkansas river about nine miles west of this town then. That was two and a half miles south-
6808 east of Oxford. Yes, sir, I lived on the east side of the river. Well, sir, the first 80 we settled on, the house was three-quarters of a mile from the river, and the land ran down to within half a mile of the river, and then in 1874 I bought a tract of land adjoining the river. The first land I spoke of was principally first bottom land. I was on that farm from 1871 until 1885. In 1885 I moved from Oxford out near Caldwell, in the west part of Sumner county, and lived there a few years, and in 1896 I came back to the Arkansas river bottom again. I left in 1885 and got back in 1896. When I came back near to the Arkansas river I lived there three years again, about half or three quarters of a mile from it, and bought eighty acres of land there. Then I moved east of this town, and now I have got back west of it again. But I have owned land on
6809 the Arkansas river ever since 1874, up to just about a month ago, when I sold out. Yes, I have been on the Arkansas river considerably during the last nine years. I don't suppose I have been away more than three or four months at one time. I have had land over there and have been back and forth frequently. Yes, sir, I was on the river frequently from 1871 to 1885.

As to how the flow of the Arkansas river during the first nine years I was there, excluding high flood periods, compared with the average flow of the river during the last nine years, I will say, sir, to answer short, I would call it about the same, in my estimation. As far as I can judge there is no material difference. I have dug—you might call it a well—I have dug holes on the low land. I would go out into where there was a swale and get drinking
6810 water there when we were out farming. Yes, sir, we dug most of those holes in the low places, on account of it being easy to get to it. I have lived right on that piece of land, on that lot there next to the river. When I was farming there I was generally at my father's house up over there on the higher ground. On the higher ground the level of the water underneath varies. I have not been over there to the river now for—well, I have been over to my sister's place there several times, but I will say you can find water any place on that 40 acres there anywhere from two to ten feet deep. It varies with the surface of the ground, yes, sir. We

raised principally corn on that land. That is the only crop I ever had. I have had it rented for wheat for a time or two, and have had some very good wheat and some very poor. No, I never raised any good corn crops on that first bottom land without rain to mature it. I never raised a good crop without rain. Yes, sir, I know the farmers pretty well up and down the river there in that community,
the biggest portion of them, for a few miles. As to whether
6811 prior to the bringing of this suit I ever heard any of those
farmers complain that their crops had been injured or their lands had been made less productive by the falling of the level of the water underneath those lands, I would say, no, sir, I never heard any of them complain of it. As to the value of lands in that community, taking both first and second bottom lands, I don't know as the second bottom lands have ever been higher, but the low bottom land is not as high as it was a few years ago, since the flood of last year. The flood hurt that some. But taking all of the lands up and down the river there in my community, they are higher now than they ever were before, yes, sir.

Cross-examination.

By Mr. ASHBAUGH:

Yes, sir, this 140 acres of land I spoke of practically all overflowed
last year, except the sand hills. No, it didn't overflow this
6812 spring. There is a draw up there through that place where
the water stands the biggest part of the time. I have also got some pools there that show that the water is not more than three or four feet, you might say, on the biggest end of that 40 acres there. If the river has been low for two or three months then those pools go down some. As to what causes that, well, the river going down. Yes, after the river has been up quite a while the water rises in those pools again. Those pools are only about thirty rods from the river, on this low land. Yes, sir, to the best of my knowledge the water back until it comes to the second bottom will rise with the river on that low land. (Objection.) As to whether it will rise until it is on a level with the water in the river, I will say no, not until it is level. I have seen the river there—the banks are higher along next to the river. If it was not for that fact the river would get up there and it wouldn't go down for a week or such a
matter, but if it stays up quite a long time of course it would
6813 naturally seep out some. Yes, sir, if the river stays up for
two months it will rise. Where it is only two or three feet down to the water of course it will rise up, every time. Yes, sir, after the river rises it comes up and it goes down after the river goes down. I can see that much. (Objection.) To a certain extent, if the river stays up or down for a long time the water in this land seeks the level of the water in the river. During a dry year from lack of rainfall if the river is up, as to whether the moisture is nearer the surface on this land than though the river was down, I

will say, if it is not too high it helps the crops, but on this low land it is a detriment to the crops generally when the river is up; that is, on my land. There is other land that is not that way, but on the biggest part of my land. The high water didn't affect Mr.
6814 Hahn's land like mine. Yes, if the water didn't get too high the high water level coming from a high river would benefit the land (objection); that is, so that it don't get too close to the surface. I did have land there that if the water got within three feet of the top or the surface it was an injury to the crop. The corn would stay too damp. We have had it in corn and it stayed damp there until it would kill it. The moisture was right at the surface of the soil, and that was too wet. My land is too wet, surely. No, as to whether that is the reason I am here today (objection), I will say that is not the reason I am over here, because that land is too wet. Yes, a part of my land is too wet, I will admit that. I
6815 sold that land about a month ago, of course. I have farmed where the water level stands ten or fifteen feet from the top of the land and always had better crops than on this low land. Yes, sir, some land is better than others. On my second
6816 bottom the water level is about twelve feet from the surface. I have raised better crops, one year with another, on the high land than on the low land. Yes, my high land is better than this low land. There is gumbo in the low land in some places.
6817 Yes, I have got sand ridges—any kind of land a man wants there, nearly. Yes, having the moisture there beneath would be an advantage to the crop, if you don't get too much of it. About the time it matures it would be an advantage.

Redirect examination.

By Mr. GREGG:

On this last piece of low bottom land I had 78 acres. About all of it was first bottom. I sold that and got $1,500 for it. Yes,
6818 sir, this is the land that overflowed. Prior to the time it overflowed, that is, three years ago, I was offered $2,100 for it. If the water level underneath the surface rose until it was very close to the surface and stayed there for some little time, that would injure my crop. I have had it stand there so I couldn't get in and plow it, it would be so wet from the moisture below. Now, that is on those extremely low places. If it would come within five or six inches of the surface, but so as to take in the roots of the crop, and it remained there for some time, that would ruin the crop; so that in order for it to be a benefit it would have to come just within the right distance and stay there the right length of time, yes, sir.

Yes, sir, we farmers out there depend upon the rainfall for our crops. No, sir, we never had any good, fair crops out there
6819 unless we had the rains for them. That is true in the first bottom land as well as on the second bottom. When I came here in 1871 the biggest part of the bottom was all taken and there

was some apparently yet to be taken in this country. No, the biggest part of the uplands in Sumner county was not taken in 1871. All of the Arkansas bottoms through Sumner and Cowley counties were taken in 1871. There was little left in that year in our
6820 neighborhood. There might have been some sand hills that hadn't been taken. The upland here between Winfield and Oxford was all taken up about in 1871. I don't know of any that was not taken except possibly some school lands.

6821 T. C. PRICE, Winfield, Kansas.

Direct examination.

By Mr. DAWSON:

I live in Winfield, and my principal business is farming. I am fifty-three years of age. I moved into Winfield two years ago in January; before that time I lived on my place six and a half miles west here. The Arkansas river is just a fraction from my lower 40 there. There is 20 acres between it and the river bank. I bought that in February, 1884. Previous to that time I was a renter along the Arkansas river in that locality. I have had an acquaint-
6822 ance with and observation of the Arkansas river since 1872, and from that time down to the present time I have had an opportunity to observe the flow of that river, and I saw it during that period from week to week or month to month.

As to the average flow of the Arkansas river for the last ten or twelve years as compared with a like period in the earlier years that I knew it, I would say, cutting out the year 1873, that was dry, and cutting out the year 1877, that was the flood, taking the year 1904 out, that was the flood, the fall of 1902, which was dry,—barring them, the fall and the summer, the dry years and the flood years, count them out, I think there is a little more water in the last ten years than in the first ten years; and if you leave those in I think it would average just as good or a little better in the last ten
6823 years. Yes, sir, 40 acres of my land that I purchased in 1884 was on the low bottom and 30 acres was on the second bottom, and then it runs right up onto a ridge, about ten acres, where I built. My wells were bored there; I had no occasion to dig any. Yes, sir, I dug several wells on the low bottom.

As to there being any change in the water level in later years compared with the earlier years, I can't see that there has been. Of course I am well aware that the river is in what we call a "V" shape and when the water rises there it comes back up. Of course it takes quite a little while for it to back up. It is hard to run water up hill. Of course when this flood comes out it throws it up into a "V" shape. But speaking of just the average water level, or the depth at which one would have to go down for water, I don't think there has been any perceptible change in the twenty years on my land.

6824 Yes, sir, I think the constant farming of lands has a tendency to run it down or deteriorate it to a certain extent, and making allowance for the natural deterioration or running down from farming, I would say the land is just as productive now as it was when I went there. It is just as good.

No, sir, I never heard any of the farmers in my locality before the commencement of this suit in 1901 complain that their lands were becoming less valuable or less productive because of the drying up of the river or the sinking of the general water level of the country.

Cross-examination.

By Mr. ASHBAUGH:

No, sir, I can't say that I knew that the legislature of 1901 made an appropriation and ordered this suit to be begun. No, sir, I didn't see anything about it in the newspapers. I heard of it after it had been begun, but not right at the time.

On my land it is from two to five or six feet to water. I
6825 can't see that it is any deeper at one time of the year than at another. I have dug in the spring and in the fall. It is influenced by the presence of the river, if at all, very little. Yes, I might say it was, very little. When the river gets up with its banks full it has a tendency, of course, after a while, not right at the spur of the time, but after a while it will seep back, and when the river goes down it will recede to a certain extent. Yes, sir, it does do that. As to how far back the water level varies, I will say that in a low place there, it comes up in that. Where it is not in a low place I don't think it does, because the land—as I said at first, it is hard to run the water up hill. The land kind of slants and the water is pushed back. The place next to the river will have water in it when the place farther back—the water under my land will vary at different stages of the river from one to seven or eight inches, not more than that. Yes, my land is affected a little by the
6826 flow of the river, but not a great deal. Where witnesses have testified today that the water level varied from five to six feet under their land, I would say their land is of a different quality or differently located from the river than mine, yes, sir. In judging of the height of the river, I take into consideration the water that runs in the river. The river bed is always about
6827 the same. It changes a little. Yes, the river bed has changed right at my land. It is not as wide as it was twenty years ago. I think that may extend up and down the river there half a mile at that point. Yes, there are islands there now that were not there twenty or thirty years ago, and to a certain extent they are grown over with trees. I can't say so much about the island in the river but I know I have observed where it has come back to the bank that maybe there would be a great big cottonwood tree or something that would be partly washed down. It will catch

stuff in there, and there will be a lodgment of trash and things that come down, and that generally forms there as it comes down, and the wind blows the dirt to some extent, and it will come there and kind of form, and when those little trees start they kind of make a bank there for the dirt to form on, and grow, and then nothing but an excessive flood would wash it out after that. The excess-
6828 ive flood of 1904 didn't wash out the bank of what formed there a few years ago.

Yes, sir, I have been to Arkansas City. No, sir, I know nothing about the canal down there. I know they have a canal down there, but the conditions I know nothing about. I don't know that they have had to practically abandon it. Yes, sir, I have heard about Colorado taking the water for irrigation. Yes, sir, there is one stream flowing into the Arkansas river above the Ninnescah—the Cowskin, up toward Wichita. I don't know whether it is a perennial stream or not. I think it goes dry. I never saw the
6829 Ninnescah go dry. I never knew the Arkansas river to go dry at Oxford. I have seen it pretty low. It was pretty low, I believe, in 1903. It was low in 1902. I don't — about 1901. I think 1901 was one of the driest years. It might have been one of the dry years, but still we had local showers that passed through there. I have never raised any corn on that land yet with-
6830 out rain. No, you can't raise corn without moisture. It is impossible. I think in 1900 the river was low. I should say that during the fall of the last five years of the '90's it was normal.

DENVER, COLORADO, May 16–17, 1905.

6831 LOUIS G. CARPENTER, Denver, Colorado (Recalled for Further Direct Examination).

Direct examination continued.

By Mr. DAWSON:

I am the same Louis G. Carpenter who testified in this case in Denver in the month of October, 1904. At that time I spoke of certain investigations which I had been carrying on and directing, and stated that they were not completed. Those investigations
6832 have been carried on since that time. The investigations which particularly relate to the ground water in the valley of the Arkansas river, its source, its movement and the influence or lack of influence of the river upon the ground water have been carried on since last October and up to the present time. These investigations have consisted first of a series of wells at different places along the river valley, sometimes wells sunk by us to the ground water; the levels have always been run over the surface of the ground and the difference in level of the ground water at the river and at these different points determined by actual levelling. In

some cases open wells or wells of the people living along or in the vicinity desired to be covered have been used, but as in these times drive wells have taken the place of open wells almost entirely, we have very generally had to sink our own holes in the ground. These lines of wells have covered part of the country between Hutchinson and Wichita, especially in the neighborhood of Colwich and Mount Hope. They have been run there as near at right angles with the river as the roads would permit; that is, the roads were used rather than going across private property, and lines extended both north and south of the river in the vicinity of Colwich and at Mount Hope and cross lines of levels and wells
6833 were run east and west. That second line would be more nearly parallel with the river than the north and south wells. At that particular place the river runs a little southeasterly, so that neither of them are quite at right angles with the river. They however give the means of showing the greatest inclination both of the surface and the ground water. There were two east-and-west lines north of the river and three lines north and south at that place. They extended about nine or ten miles from the river. One of them extended nearly ten miles. South of the river there was also an east and west line connecting some wells near Mount Hope and Colwich, and subsequently another line was extended for a number of miles still farther south. Now, of these wells, sunk generally a mile apart, records were taken at pretty regular intervals, of the ground water. That was since last August and up to the present time. It has not been at regular, prescribed dates, but it has been from four or five days up to two weeks intervals. It was found that the change in the ground water was very slight and slow, and that observations taken at longer intervals of time would answer the purpose just exactly as well as those at shorter intervals. The distance of the first well from the river varied somewhat, but generally within a short distance—a hundred to two or three hundred feet. And then they were put at a regular distance apart. Several times we had two or three or four wells within the first half mile; then after a distance of a mile was reached the wells were placed approximately a mile
6834 apart, speaking generally. I carried the farthest of these wells back from the river on the Colwich line, north and south from the river, nearly eleven miles. Now, that was nearly at right angles. I was going to separate that set of wells because on those we kept up regular observations. As to how the lines which I have spoken of as running approximately parallel with the river were situated and how far they extended and about how far apart these wells were placed, I would say, those were also placed in the vicinity of Colwich, Mount Hope, Bentley and Burrton at the road corners, a mile apart, and the line which for convenience we gave the name of the Bentley-Burrton line ran ten miles east and west. Afterwards that line was extended farther east on a special series, a little later; and also from Halstead west the lines

ran east and west for ten miles. The nearest one in that case was about six miles from the river, and about nine or ten at the other end, from the river.

6835 Yes, sir, these wells were sunk in ground left open for road purposes, but not in the beaten path of the road; nor were they in the enclosure of the fields, as a rule. They were placed close to or under the fence, to keep stock and other things from getting into the wells, and to be out of the way. To make this complete, possibly I had better put in another line of this same series that was not mentioned a moment ago. On the south side of the river a line of wells and levels was run connecting Colwich and Mount Hope. Colwich is several miles south of Mount Hope, and so this line zig-zagged to connect the two places. It therefore runs near the river at two or three places and then runs away as the river, as I have said, runs to the southeasterly. At some other places in the State some wells

6836 were also sunk on which records were kept for a short time, and regularly, but not so systematically as on these, and those were frequently close to the river, as at Mulvane and at Arkansas City, Derby, Hutchinson, etc. Now, the second class of wells which I spoke of were a series of wells run to determine the distance to the ground water. It was found in starting this series of observations that the change in the ground water was exceedingly small; it did not rise nor fall much; and consequently by taking a series of levels and distances to ground water we would get substantially the position of the ground water by a single series of records instead of a long series, and that enabled us to cover a little larger extent of country than we had at first in mind. It was also desired to see the explanation of some changes in the levels which appeared as we passed over a slight divide toward the adjacent streams, and to carry that on past these other lines of drainage, like the Little Arkansas and the Big slough, etc., and to see the slope of the water surface in its relation to these lines of drainage; hence there were lines extended in several different places, as for instance from Valley Center on the east of the Arkansas river across the Little river and the main river and the Big slough to several miles southeast of the town of Maize. There was another line that was the extension of the line I speak of as the Bentley-Burrton line, which was ten miles

6837 long. That line was extended easterly across the Little Arkansas river and several other creeks to the vicinity of Sedgwick, a distance of eleven miles in that direction, and then also lines were run across the river in the vicinity of Kinsley for a distance of about seven miles; and another line of wells extending south from a well between Colwich and Mount Hope for a distance of nearly seven miles. This line crossed the Big slough, Cowskin creek and several tributaries. There was also a line at Derby and Mulvane and Arkansas City on which the records were kept for a short time; also a line at Hutchinson extending out along the line of the Rock Island and Santa Fe in both directions from Hutchinson

for quite a number of miles—I think it was about twenty miles in one direction and twenty-six in the other. The railroads leave Hutchinson nearly at right angles with the river, one to the northeast and the other to the southwest, so that the railroad was followed there because it gave a line more nearly at right angles than the roads, and thus the distance could be covered with a little less travel. In general, it may be said that the line of elevation of the water surface follows that of the ground (objection); that with the rise in elevation of the ground there was generally found a
6838 rise in the surface of the ground water, and if the ground descended, as toward the creek, then the surface of the water descended also. When a creek channel was reached the ground sloped toward the creek channel from both sides; that is, there was a depression; and in most cases it was found that the level of the ground water sloped in the same manner, that is, toward the water in the creek. In other words, the water in the creek was lower than the water in the ground on both sides. There were some exceptions. This is shown in the Burrton-Sedgwick line possibly as clearly as in any of the lines run, and as this line crossed some five lines of drainage, it has a variety of those ups and downs in the line. This line crosses a little tributary on the west side of the Little Arkansas, then the Little Arkansas within half a mile, a small creek bed nearly three miles east, another creek at a distance of another mile, and one at a distance of two miles, and another at an additional distance of a mile and a half. This line extended from west to east. Along this line there were, I should say, from thirteen to fourteen wells. Approaching the Little Arkansas river from the west, both the ground water surface and the surface of the ground slope toward the Little Arkansas river. As we pass the channel of the Little Arkansas to the east both again rise—the surface of the ground and the ground water—so that there is a valley both in the water and
6839 and in the surface of the ground. Between the Little Arkansas river and the small creek three miles east there is a summit in the ground surface but apparently not in the water surface. In other words, the creek bed is higher than the Little Arkansas, and it seems to be higher than the wells in between, or at least higher than the water in two wells—well No. 7 and well No. 6. The ground water also slopes toward the next creek, which again occupies the bottom of the valley both of the ground and of the water. Well No. 9 was between this creek, which seems to be without name, and the next creek east, which is sometimes spoken of or is commonly known as Jester creek. There were two wells sunk between these two creeks; both of them were above the water in both creeks; that is, there was a summit both of the land and of the water between the two creeks. Passing Jester creek, wells Nos. 11 and 12 are between Jester creek and the next branch, which is known as Gooseberry creek and there is again a summit in the ground water, so that Gooseberry creek also is in the valley both of the ground and of the water. Passing Gooseberry creek, well No.

13 was located and the water in that well was above the water in Gooseberry creek. On the line passing south, a mile west of Colwich, this general effect is not as noticeable as in the line just mentioned, but there is a very marked rise and fall of the water surface, so that Cowskin creek in that case is higher than the level of
6840 the water in the well on either side of it. As we pass south the water rises as the country begins to rise. Those I have mentioned have reference to the cross drainage, that is, running back from the river and crossing the valleys of streams. Now, there are other cases illustrating the general statement that the water varies with the rise of the country. At Arkansas City the wells went nearly three miles from the river. (Objection.) The lines passed westerly on a section line which, there, is nearly at right angles to the river. After the first half mile the country rises quite rapidly to the elevation of practically eighty feet above the river at the first road in the section and to an elevation of slightly above one hundred feet at Mr. Baird's, a little over two miles from the river. The ground water then rose from the surface of the water in the river—(objection)—to an elevation of nearly 77 feet. West from Derby the line extended over three miles from the river.
6841 The road bends to the north and follows the river and then follows a section line. The country rose to an elevation of 24 feet above a point on the bridge across the Arkansas river west of Derby. This line crossed the Cowskin creek. There were five wells. The fifth one was west of the crossing of Cowskin creek and four were between Cowskin creek and the river. The water in the fourth well was the highest, and from there both sloped toward Cowskin creek and toward the Arkansas river; but the general slope was pretty uniform toward the river. Yes, sir, the slope of the water in a general way conforms to the slope of the ground. Now, other illustrations could be given specifically on almost all of these lines. These have been mentioned because most of them crossed some drainage channels. If we take the Colwich line on that line the ground rose, passing north from the river, fairly uniformly to well 5, which was about five miles from the river; but the ground at well 6 was still higher than No. 5. Then the ground descended to the crossing of Kissaway creek, and after passing Kissaway creek the ground rose for a mile and then descended to the north toward Turkey creek, which is just north of Halstead, so that the level of Turkey creek above the datum at the river—the ground north of Kissaway creek was nearly 27 feet and the ground at what I spoke of as well No. 5 was
6842 nearly twenty feet above the Arkansas river. The level of the ground water rose from the river and reached its highest point at well No. 5, where it had risen thirteen feet above the river; then it descended toward Kissaway creek and there rose again to a point a little short of Turkey creek and then descended toward Turkey creek. That is, the distance to water at wells 5 and 6 was greater than the distance at wells 2, 3 and 4, but the increase in

depth was not as much as the increase in elevation of the ground, so that the water was constantly rising. Yes, sir, the water was constantly rising in elevation in the wells as compared with the river as you departed from the river. As you get away from the river the water in the wells was constantly higher as measured from the sea level or from the river, either one. The same thing is true in a general way on the Mount Hope line, that is, the north and south line passing north from Mount Hope and crossing the river at Mount Hope, the ground rising in the distance of seven miles sixteen feet and the ground water surface rising between fourteen and fifteen feet. The other records have essentially the same characteristics; that is, the lines on the north side of the river in the vicinity of Mount Hope and Colwich show a rise in the ground surface and a rise in the water surface. On the east and
6843 west lines as you go east the ground shows a descent and the surface of the ground water also shows a descent that is pretty nearly parallel with the ground, except when channels are crossed. When those channels are crossed there is a slightly increased rapidity in general and a rise in the ground water surface as you pass the creek, on the other side. The greatest dip of the country in that locality is neither east nor south—that is, in that direction. It is southeasterly, which is parallel with the direction of the river. The river follows the direction of the general dip of the country there, yes, sir, and these lines I have spoken of as running east or approximately east are Mount Hope lines, running in the same general direction with the river. They were run in that way simply because of the fact that they were highways which could be used. I would have chosen, if the country had been absolutely open, lines at right angles and parallel with the river, which was impracticable, so I did the best I could. Yes, sir,
6844 the line of wells running parallel with the river ran with the dip of the country. The east and west lines were more nearly parallel with the river than the north and south wells at this place. There were two sets of lines run; that is, two characters of lines, one of which lines was, as far as conditions would permit, run at right angles with the river, and one set of lines, as far as conditions would permit, run parallel with the river, yes, sir, and the fall of the country is with the river. Yes, sir, at that place those lines which were run most nearly parallel with the river were also run with the fall of the country; that is, in this square that was the case; and those wells run most nearly at right angles to the river were run across the general fall of the country, but with the local rise or fall to and from the river, yes, sir. In this portion there is not much fall toward the river as usual, because the valley has been somewhat flattened out.

The general characteristics of that country east of the State line, and in all countries, is of course a series of valleys, but throughout the plains region there is a general slope of the whole coun-
6845 try easterly, quite a marked one. The river valleys have broken that up with furrows so that you have a slope toward

the river valleys besides, as at Dodge City, Garden and elsewhere. At this place the side ridges have greatly disappeared. Throughout the western portion of the State for 110 miles the Arkansas river runs approximately east or a little south of east, and throughout that part of its course the general drop of the country is from west to east, yes, sir, and the local drop along the river is toward the river from each side, yes, sir, that is, it would be a groove across the plains, and whatever direction the river takes from there on this same general drop to the east continues in either a greater or less degree, and the same local drop continues only in less degree, that is, on the river, as you go farther east and farther south in the State of Kansas, yes, sir. It continues the same with slight variations due to local conditions.

6846 These lines of wells were intended to be so placed as to show the general characteristics of the streams, taking different places, for instance at Arkansas City, Derby, Mulvane, etc. This region near Colwich and Mount Hope was a region from which a number of witnesses had testified in regard to their recollections of the ground water, and these wells were put there to determine what were the facts. At Hutchinson, that was at the upper end of the flattening out where the rolling prairie might be said to come to an end and a spreading out or flattening out of the country takes place up toward the Smoky Hill. Then at Kinsley, it was also a convenient place. Now, at Garden City, at Dodge City, at Great Bend, lines of levels had been run by the United States artesian and underflow investigation a number of years since, and those were all in evidence—those records—so special lines of

6847 wells were not run there to as great an extent.

Yes, sir, these investigations which I have carried on along these lines since last October strengthened or confirmed me in my views as to the ground water as those views were expressed at that time. (Objection) They confirm the conclusions which seemed to me then to be probable but where we hadn't gotten as much data as I desired.

As to what influence, in my judgment, the Arkansas river in going through Kansas has upon the ground water in the valley or in the uplands adjacent to the Arkansas river in that State, I would say (objection), as the ground water in the uplands is uniformly above the water in the Arkansas river, and as that in general seems to rise and fall—that is, its summits, variations in elevation—between the different streams, I think the ground water of the upland can be excluded, to begin with, as being outside of the influence of the main river. Now, in the bottoms, in general the water in the bottoms seems to incline towards the river; that is, the water in the bottoms is above the water in the river. When the river rises the wells showing the elevation of the ground water for a short distance from the river also show a rise. That we have not found in any case far from the river. It is at a moderate distance. I

6848 think the greatest distance we have found has been from

1,000 to 1,500 feet. I do not for the moment recall one at more than 1,100 feet. The underground waters would follow the line of descent, the same as would be true of surface water, and thus if the river rose from one to two or three or four feet, while the water had been sloping toward the river there would be for the time being a reverse slope such as was mentioned and described in an exhibit put in in the direct testimony last fall, and thus there would be a condition where the river could be contributing to the ground adjacent to the river for that distance. The rise of the ground water at a short distance from the river would be the resultant of some that might come from the river and some that was coming from the back country. I think I spoke of the river as acting as a kind of dam, by which I simply meant the same as if the river backed up over the mouth of a sewer—it prevents the free discharge of the water that is coming down from the country. And as long as the slope of the ground water away from the river is toward the river it must still continue to flow in that way, certainly, if that is the greatest slope, and that would continue until some of those wells would probably rise. Now, when the river has gone down, then those wells close to the river have gone down
6849 and the general line of the slope of the ground water has become the same as it was before, which seems to be the normal line or condition of slope.

As to what my observations carried on indicate as to the general direction or movement of the ground water, I would say (objection), the ground water has been assumed to flow in the direction of the slope—and that is scarcely an assumption, any more than assuming that gravity acts there as it does elsewhere—and if the general physical laws act in the Arkansas valley the water must follow the line of greatest descent, which, generally speaking, is parallel with the river, modified by the slope of the valley toward the river. Now, where that valley is marked then the lateral slope is much greater than the general easterly slope. Where that valley is smoothed out then the lateral slope is frequently not as great as that down
6850 the river. If the river were flowing directly east and the general fall of the country was to the east and the local fall on the north side of the river was toward the river or south, then as to the general direction of the movement of the ground water on the north side of the river, I would say the greatest slope on the north side of the river would be to the southeast. It wouldn't be quite south, nor east, but it would be a resultant of the two; and that movement would be a movement which might be properly described as toward the river and with the river, yes, sir, I think so.

As to whether these wells which I sank in the various lines of wells in all instances showed the effect of a rise or fall of the river to a distance of as much as a thousand or 1,500 feet, I would say, there was quite a marked rise in the river early in October of 1904. In that case the well 200 feet from the river on the Colwich line rose also. The well ⅛ of a mile from the river showed no influence.

I don't think we have an instance as far as that. I find but two wells that are between 500 and 1,500 feet; both of these are about a quarter of a mile. Neither of them shows any clearly marked relation with the river.

6851 As to whether if the river would rise three feet it would raise the water in a well 500 feet away three feet or less, I would say, it is less; that is, the rise which follows in the well is less than the rise in the river, and it dies out quite rapidly, that is, the variation. As to whether the level of the ground water at the time of low water flow, at a given distance from the bank of the river, was three feet higher than the level of the water in the river, and there was a rise of three feet in the river, assuming the rise to last any length of time from a week to eternity, as to whether the well at that point would show any rise in the level of the ground water, I would say, if the rise in the river were for a short time, say a few hours, such a well would probably show no effect whatever; that is, the effect would be entirely secondary to the other changes which may take place in the well—to the change of temperature or other changes found to take place in the ground surface. If the rise in the river should remain or be a permanent thing or last for some time so that these wells could adjust themselves, there would be an effect shown in the well, because that water would be flowing down from the upland to the stream and it would reach such a slope that it would be of a permanent character; that is, the water would flow on by as fast as it reached it from the upland, and that would mean something of a rise in that well. It would be under the same principle as in a stream. You put a dam in the stream and it may affect the height of the water for some distance back, even above the level of the water at the dam; assuming, of course, that the level

6852 of the ground water at the point where the well was to be sunk was as nigh as the level of the water after the rise had taken place in the river, yes, sir.

As to whether it would be possible for the river to actually contribute any of its water beyond that point, I would say, no, it would not. And as to whatever rise took place at that point where the natural level of the ground water was equal to the level of the water in the river, making allowance for the rise, as to what fact that would be due to, I would say it would be due to the water coming from the back country or to the water higher than that point, and as to whether that would be really *be* the true point of meeting of the two, I would say, as I understood the case this was above the level of the water in the river and the point of the meeting of the water from the up country and the water from the river would be below that, at the level of the water in the stream.

6853 As to whether from my investigations I could determine what would be a fair average limit of distance from the stream through Kansas at which the ground water would be affected by the river in rises such as I know of from observations of those streams, I would say (objection), I have not

seen anything from all the facts that we could find of the wells and from the rising and falling of the water in the wells close to the river that would make me think there could be over 1,000 feet; in fact the variation which has been found would make me think that the width was less than that; and that would, in my judgment, be a fair maximum distance on an average through the State. (Objection.) Yes, sir, I think so. And at that distance from the river, approximately, as to what difference in the elevation of the ground water would be caused by a given rise in the river, I would say, at that distance the rise and fall due to the river would be so small as to be negligible; that is, possibly .1 of a foot. No,
6854 not for each foot rise in the river. Not so much as that. A rise of the floods in the Arkansas river as they come down is not usually more than 4 feet. Those are the pretty good size floods. A flood of from 2 to 4 feet would not be apt to cause a rise of more than a few inches—from .1 of a foot to .5.

As to whether I have any way of estimating what acreage of land could be affected by such a rise in the level of the ground water, assuming a strip one-quarter of a mile on each side of the river for the 310 miles of the river's length in Kansas, as is alleged in the amended bill of complaint, I would say, well, that can be very easily computed. Yes, sir, I can state about what that would be. (Objection.) That would be a strip 120 rods wide and 310 miles long. At 240 acres per mile and for 310 miles it would be 72,240 acres.

Yes, sir, I put down some wells in the vicinity of Colwich and Mount Hope, for the reason, as stated, that those places were chosen because of certain testimony that had been given in the case made by the State of Kansas in chief; and as to what was disclosed by these wells as to the water level of the locality, I will say
6855 there were several witnesses who testified as to their ownership of lands in the vicinity of Colwich, Mount Hope and Bentley, and as it happened these lines of wells were by the places of nearly all of these witnesses, and where possible a well was put down in that vicinity. In several cases two wells were placed next to the land described by the different witnesses. For instance, wells Nos. 3 and 4 on the south Colwich line were both adjacent to the land owned by Mr. Harrison; one was at the northeast corner of his tract and the other was at the northwest corner, on the front of it; that is, on the road which ran right by that quarter section. The same two wells were also adjacent to the land which had been owned by Mr. Rutledge. Those were both fronting it. Mr. Rutledge's place and Mr. Harrison's place were on opposite sides of the road. As to the character of the land in these two places in the road, as to being level or otherwise having about the same elevation, I would say there is very little slope to that country. There is a ridge that has a little elevation, but as a whole that is a very uniform country. The water in these
6856 particular wells Nos. 3 and 4 is practically at the same depth from the surface—4 feet. These wells were first measured on

August 27, 1904, and Mr. Rutledge, as I understood from his testimony, stated that the water was nine feet and had gone down three or four feet. Now, wells Nos. 2 and 3, on that we call the Colwich-Mount Hope line, were adjacent to land owned by Mr. Breese, and we found the water in these wells five and a half and seven feet deep respectively, from the surface. I am not sure that he stated how far the water was, but he stated that the water had gone down three or four feet, which would have brought it pretty close to the surface. Wells Nos. 6 and 7 on the same land were adjacent to the land owned by Mr. Tupper, who testified. Well No. 6 was 5½ feet, while well No. 7 was 4½ feet.

As to when these four wells I have last mentioned were put down, with reference to the hearing at Wichita, I would say, well, those were early in October of 1904. Wells Nos. 12 and 13 of that same line were adjacent to the property of Mr. Huss. In October, 1904, these wells were 4½ feet to water, and in March, 1905, were only about 3 feet from the surface. I think he stated that the water was
6 or 8 feet from the surface. These wells were about 200 feet
6857 from his old house. Well No. 3 of the Mount Hope line was
next to Mr. Jorgensen's place. This varied from 7½ to 5½ feet from the surface during the time of our observations, the first one being made August 26, 1904. I think I stated it was 16 feet. Well No. 4 of the north Colwich line was next to the place of Mr. Hansen. The water there was found at from 3 to 3½ feet from the surface. I think that his testimony was that it had been from 7 to 8 feet. This measurement was made on August 27, 1904. I believe he had two places. Well No. 3 on the Bentley-Burrton line was also next to the other place concerning which he testified. The water there was less than 3 feet from the surface. I think he testified it was 6 feet. Well No. 6 on the north Mount Hope line was next to the place of Mr. G. M. Shive. The distance to water was 5 feet. He stated that the water was from 6 to 7 feet. Well No. 5 of the Halstead-Burrton line was next to the place of Mr. J. W. Shive. The water was found at a depth of 6 feet. I think he testified that it was originally 6, but that it had lowered 3 or 4 feet. I think one witness stated that on the distance of examination the depth to water at Bentley was eight feet. We have a well at the north-
east corner of Bentley, and on August 27, 1904, that was prac-
6858 tically 3 feet.

As to what my further investigations and conclusions are as to the source of the ground water or that water which is found underneath the surface of the valley of the Arkansas river and under the uplands, in addition to what I testified when I was on the stand before, I will say (objection), the further examination of all the facts available and the continued study of the conditions of that valley have confirmed the general statements made last fall and confirmed the belief that the same general laws in that respect are acting there as elsewhere; that is, that when rain falls upon the ground a certain amount of it will descend into the ground beneath

and that it furnishes the supply to the underground water there as it does everywhere else. Now, in this case that is evidenced or shown by the fact that this water rises as we pass away from the river; that we have, in general, the ground water higher than the drainage lines either way, and therefore that that water is contributing to these streams rather than the streams contributing materially if any to this ground water. We do know that the rain sinks into the soil. The amount which sinks in would be greater as the soil is more porous—in other words, more sandy. If the rain does not form surface streams it also shows that it does not run off materially on the surface, and that is characteristic of quite a large portion of the immediate valley of the Arkansas river from Hutchinson, at least, west; that there are no surface channels—no surface streams—especially on the south side. Now, that would simply indicate that the water does not run off. If it did it would make channels. Therefore, it must sink in. The ground is sandy, and in some of those cases it is pure sand, and hence of the rainfall under those conditions a very large percentage is absorbed by the ground and soaks down until it reaches a layer that is impervious or until it reaches the ground water, and that helps to make the rises that we find in the ground water; and it is shown in another way also by the fact that in many cases the ground water rises after a rain. That shows a connection between that and the rains. As to whether a long drouth over a large area of country—and meaning by that two or three consecutive years in which there was little rainfall—shows any effect upon the ground water, I would say, very materially in many places. The contribution from the surface to the ground water must necessarily be less even if all the water sinks in. The fraction which is absorbed would be approximately the same; that is, the percentage, and with the higher elevations that water is all the time tending toward the lower elevations. In the course of a long series of years that tends to reach a condition of stability; that is, a slope that remains approximately the same. But if that continues to flow, as it does, and the supply is stopped, there must necessarily be a dropping of the water under the higher elevations anyway. As to which would first show the effect of this continued period of slight rainfall—the water table under the uplands or the water table under the lowlands to which the uplands drain, I will say, well, I hardly know. If the lowlands were supplied only by the water from the uplands—that is, by the water soaking down through the ground—the uplands would show it first; but that is not the case. There is quite a large percentage of the rainfall that falls on the lowlands that also contributes to its water, and it therefore would be a question as to which has the greater effect, and as I have not considered the relative importance of those two, I would hardly feel prepared to say which was the greater without a consideration of the question involved. As to whether it would take a period of considerable length of slight rainfall—less

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than normal—to make any considerable or observable change in the ground water level, that is, of a foot or two feet in the level, over a large area of country, I would say, well, no. It would depend, though, upon that amount of excess or deficit. A period of excessive rainfall that came so it would soak in might be shown very quickly, and that period of excessive rainfall would show more quickly than a period of drouth, because that is immediate and is considerable. You may have an excess of six inches or a foot in a month or two if that soaks in. And if a drouth were considerable for a year or two, as to whether there would be a corresponding fall, or, if not, as to whether the fact of the slowness of the movement through the ground would have anything to do with that, I would say, well, there almost always would be a fall; but as to whether it would show a fall with equal quickness and to as great an extent as it would show a rise from an excessive rain, I would say no, it would not begin to show a fall so soon, because, as I say, you may have an excess of six inches of rain that soaks in that may come within a month or two that might be available. There is likely to be
6862 no drouth or few drouths where the deposit available amounts to so much within so short a time. And then the water as it disappears from other sources than evaporation, if it is by a gradual shoving out, that movement is very slow, and hence the settling down would be relatively slow.

The amount of rainfall in extreme western Kansas would be close to sixteen inches. There is no station that I know of with any length of observations there on the border, but we do know that the general tendency is for the rainfall to increase easterly from the mountains on. At Garden City the rainfall last year was considerably above the average—26 inches, I think it was. It averages 20 inches at Dodge; it averages 30 inches at Wichita; and in 1903 at Hutchinson it was 27.63. The period is not long enough there to be as sure of its normal as at Wichita and Dodge, but it is between Wichita and Dodge. From Dodge City west in Kansas, as to how the country is with reference to showing very few streams or channels or places for the surface run-off, I would say there are almost none adjacent to the river; and as you proceed easterly, as to about where you begin to find that there is an available run-off which requires channels to carry it, I will say, the first perennial stream comes in at Larned, or possibly you may say below Kinsley, in Coon creek, and it then has perennial tributaries from there
6863 on, at Great Bend and Wichita, as we proceed easterly. And as to when the river in flood times sends water out into the sands even for 1,000 feet on each side of the stream, or a quarter of a mile, and falls, as to what becomes of a large part of that water which has been forced out into the sands along the banks of the river, I would say, its first immediate effect is, of course, a raising of the water and bringing it nearer the surface. As the river goes down that which is above the level of the river as it becomes low will soak back into the river, or its tendency will be that way, because

its slope then is toward the river, and if the water is close to the surface some of it is going to evaporate, the more as it is closer to the surface; that is, the evaporation will proceed more rapidly, speaking generally, as the water is closer to the surface.

The evaporation from a moist sand surface is greater than that from a water surface, because the amount of evaporation depends upon the total surface and the film of water covers the sur-
6864 faces of the sand and the total surface is really increased, hence it is found by experiment, as it might be anticipated, that the loss is absolutely greater when the sand is wet than if it were simply water.

As to whether the Arkansas river increases in the volume of water which it carries in eastern and southern Kansas as compared with western Kansas. I would say the river shows in general an increase; that is, there are these tributaries which are coming in, and we begin to have the conditions more as they are in the eastern country where the water coming in is from a region of considerable rainfall and saturation.

This photograph marked Defendant Colorado's Exhibit 30 is a photograph of the dam of the Fort Lyon canal and the water passing over it. As to whether this is a fair representation of the better class of dams used along the lower Arkansas river in Colorado, I will say there are many dams that go clear across the river in that way and of that type. It is the highest dam on the river. It shows in this case the water passing over it as it does at a flood stage of the river, and the dam is for the purpose of the diversion of water into the canal and is not like a reservoir dam—a means for
6865 holding the water absolutely back. Yes, sir, whether there was a flood of water or not, the water would go over the dam in excess of any amount being taken into the ditch. Yes, sir, it is true that the dam simply serves the purpose of raising the level of the water in the stream so that it may be gathered into the headgates (objection), and to help to control the water. In a sandy stream of this character the effect of the headgates in attempting to divert the water would be to scour out the bed, and they have to be held on a stream with a rocky bottom or a stream whose bed does not wash. These dams are much less necessary on such streams than on sandy streams. The engineers would usually speak of this type of dam as a wier; that is, one that the water will pass over the top of. As to whether there are any dams along the Arkansas river in Colorado which constitute any more of an obstruction or means of holding water back than the one shown in Exhibit 30 just introduced, I will say, no, sir. There is one at Buena Vista, up in the mountains, that is a higher one of this same type, where the river is narrower, but with that exception all the dams are lower
6866 that I know of. Yes, sir, this one near the head of the stream in the vicinity of Buena Vista is in a place where the flow of the river is much greater; that is, just such as would be put in most any stream for power purposes or otherwise. The one above is

higher than the one at Arkansas City, Kansas, but the lower one in Colorado is not, nor is either of them more of an obstruction than the dam at Arkansas City, Kansas.

As to the drainage area of the Cimarron, I would say (objection), the drainage area of the Cimarron in Kansas is approximately 4,550 square miles. The Grand river I think I gave in my former testimony, but I haven't it here at this moment. As to the velocity of the Arkansas river in Kansas, I would say I have the velocities from our measurements made at various places from Coolidge to Arkansas City and at different heights of the river. The velocity, of course, increases as the depth of the water increases. At Coolidge the velocity varies from 1⅛ feet up to 5½ feet between a gauge of 6 inches and a flood height of 4½ feet in depth. This is the velocity in feet per second. At Garden City the velocities were from 1¼ feet up to 3½ feet per second for the same variation in depths of water—from 6 inches to 4½ feet. At Dodge City the velocities range from 1 foot per second up to 3½ feet per second for a variation in gauge height of from 1 foot up to 3 feet. At Kinsley the velocities range from .8 of a foot per second up to 3 feet per second. At Hutchinson, from 1½ feet per second up to 3 feet per second. At Wichita, from 2 feet per second up to 2.65 feet per second, not as much variation as at the stations above. At Arkansas City, from 1¾ feet per second up to 2¾ feet per second, for a variation in gauge height of from 1½ to 4½ feet in depth. Those are taken from the records made of actual gaugings. As to whether it is possible from that data to give the average velocity for the river throughout the State, I would say one would have to assume the depth, of course, but the general statement previously made of about 2 feet per second, I think it was, is correct for what might be considered the conditions

6868 that would ordinarily be met with. As to how long it would take in a moderately good stage of water for the water to go from the Kansas-Colorado State line to the Kansas-Oklahoma line, I would say, well, we can put a minor limit to that in comparison to the floods. The velocity expressed in feet per second does not appear so large when put in miles per hour. You see a velocity of 1 foot per second is considerably less than a mile per hour. It would be say ⅔ of a mile per hour. In other words, 3 feet per second would about correspond to 2 miles per hour. It takes about six days for the water to pass Kansas, of a pretty good rise,—from Coolidge to Arkansas City. Of course with a small head it can't be identified lower down, so that except by estimates we cannot tell, but a rise of several feet in the western part of the State in some cases can be followed down, and we have followed it in about six days. A less head will take a great deal longer time, and that gives it a longer time for disappearance, so that the time is not only longer but the identity of the rise is lost, and it gives greater opportunity for

6869 evaporation, yes, sir. In my former examination I spoke of the loss in the flow of the water in the river in crossing the western portion of Kansas, and as to whether I can add anything

more on that subject on account of further observations I have made, I will say, well, I haven't them here this afternoon The exhibits already presented of the floods shown in those exhibits are typical of the floods which have been traced, and while the laws vary somewhat according to condition, yet there is very much less variation than one might expect and the general characteristics as they are shown are the same of them all. We have had a number of floods that have been traced down and we have been able to compare them. At that time I spoke of the percentage of loss between the State line and Wichita being equal to about 70 per cent. of the amount crossing the State line, and I then stated that I was making a liberal allowance. As to whether I have had any reason to change that estimate, I would say, no, sir, I think that was a fair estimate. On that basis 30 per cent. of the water would get to Wichita that crossed the State line, and that was based upon a flood of high water. As to whether that percentage would reach Wichita if I were to take the river in a low stage, I will say no, sir, I think not. Below the normal or average, as to whether it is true that the less
6870 the stream flowing in the river at the Kansas Colorado line the greater the loss in carrying it across the arid region, that is, the percentage of loss, I would say, yes, the loss is greater, from the fact that the length of time it is subjected to evaporation and percolation in the sands is greater and hence as you decrease the quantity the absolute loss may be less but the relative loss may be greater. If an assumed average flow of 750 cubic feet of water passing Cañon City could all be delivered at Little Rock without loss, as to what rise it would make in the river or what increased depth at Little Rock, approximately, I would say, if the river at Little Rock were at a 5-foot stage, which was below the average stage for 1903 and also below the first ten months of 1904,—I say ten months because I don't have the November and December records—and accession of 750 feet per second would cause the river to rise less than .1 of a foot, and for greater depths the same amount of water would cause a less amount of rise, and that is because the width of the river is greater and the velocity is greater, both. This is taken from the rating curve or discharge curve furnished by Mr. P. R. Van Frank, United States engineer at Little Rock.

I have heretofore stated that 30 per cent. of the water crossing the State line would be a fair estimate as to the amount
6871 that would reach Wichita, assuming an average flow of 750 cubic feet per second of time as the amount crossing the State line or passing Cañon City, either. As to whether any greater percentage of that water would get to Little Rock, I would say no, sir. If the average flow of the river at Cañon City and Colorado, or at the Kansas-Colorado line is 750 cubic feet per second of time, as to how much per second of time that would mean as a delivery on the average at Little Rock on the basis that none was lost after it passed Wichita, I would say it would be a little over 200 feet—225 feet—and the amount that that would raise the river at Little

Rock would be correspondingly less. Yes, sir, in 1903 at Little Rock the lowest average stage for any single month was in December, which averaged 3.6, while in March it averaged 18 feet, or, to be more exact, 17.8 feet.

In reference to the ownership and management of what are commonly known as the ditch companies or ditch corporations in the State of Colorado as they now exist, I would say nearly all the ditches or ditch companies in this State are what we would speak of here commonly as mutual companies. They are organized in the form of the corporation as a matter of convenience in business, but they are not organized for profit. There is a double reason for that; one is that they are organized essentially for mutual convenience and the second fact is that under our laws such irrigation companies are not separately taxed; the water rights are
6872 considered simply as a part of farms. The conditions on the larger streams are such that for getting water it requires a larger canal or larger length of canal and a greater expenditure for headgates and other constructions than a single individual can undertake, and this is essentially an aggregation of the water users. Sometimes canals having only two or three users are organized in the form of a corporation, and they are no different in their general character from the larger ones except in magnitude.

In my former examination I stated as to the number of acres under irrigation in the Arkansas valley and along the tributaries of the Arkansas river in Colorado, from the census report, and at that time I stated that I had some further information on this matter which I did not then have at hand. As to what I can say now as to the amount of land that has been reclaimed and is under irrigation from the Arkansas river and its tributaries in the State of Colorado from the census report on agriculture in Colorado, published in 1902, that gave the number of acres irrigated in the second division—that is, the Arkansas valley—as 281,666. That is from the report on the agriculture of Colorado. I think I quoted from a different document before. That is for 1899, issued in the bulletin of June 2, 1902—bulletin 177. The water commis-
6873 sioners of the various water districts report to the State engineer the acreage irrigated from year to year. They vary somewhat in their estimates from year to year, but the average of all these water districts from 1895 to 1904 inclusive is 312,287, and as to that average, being based upon a period from 1895 o.i, reducing the amount that is now actually in irrigation, I would say, quite probably. Now, in 1904 the reports indicate 349,420 acres in 1899, the same year as the census report showed 263,375. In general, reports from the commissioners have been larger than those of the census, I have thought because usually the census attempts to exclude all small tracts on farms like the areas covered by buildings, the areas taken by roads, etc., from the total, while for most purposes a man having 360 acres counts the whole tract as farmed, without excluding the road or that portion covered by buildings. The

census for 1899 gives the total for the whole State as 1,611,271 acres. Our estimates from similar sources to those that I gave before—that is, from water commissioners' reports and from the best information otherwise available—have made us think it was more—that is, between two million and two and a half million. The census
6874 report does not purport to give it for any year later than 1899, and as to whether there has been an average area in irrigation since that time, I would say, yes, it has been constantly increasing. Some new land has been brought under irrigation. But as to the total amount now under irrigation in Colorado from all sources, I would say I haven't summed it up, but it is between two and two and a half million acres. I think it is safely about two million acres.

6875 In my former examination, for the purpose of arriving at the amount of water that would be moving through sand and gravel such as that found in the Arkansas valley in Kansas, I was asked to state what amount of water would be moving through soil of that character in an assumed strip about half a mile in width and 100 feet in depth. Since giving that answer I have found that it was not based entirely upon the assumption made in the question, and as to what that difference was, and in order to correct it, I will say, I answered the question on the supposition that this was a solid stream of water of the supposed width and depth moving at the rate of 10 feet per day, which rate of movement would
6876 be a fair rate for water moving not in a solid but moving through sand and gravel, yes, sir, and in correcting that statement I will say, well, in moving through sand and gravel of course it moves only through the interstices or pores. The area of voids in a cross-section is about one-third of the total area, so that that result is three times what it is on the assumption of the question of flowing through the sand and gravel. Yes, sir, 10 feet per day is a fair assumption for the average rate of speed at which ground water will travel through sand and gravel such as that ordinarily found in the Arkansas valley in Kansas. Assuming this movement to be 10 feet per day of 24 hours and a width of territory of half a mile, or what would be equivalent to one-fourth of a mile on each side of the river and a depth of 100 feet, the substance being sand or gravel such as is found in the Arkansas valley in Kansas, as to what amount of water in a flowing stream would be moving through the assumed amount of sand and gravel, I will say, the quantity thus percolating through sand of that character at a rate of ten feet per day and in a strip half a mile wide and 100 feet
6877 deep would be very closely approximate to 10 cubic feet per second of time. This assumes that one third of its volume is voids, which is practically true. It does not vary very much. It is sometimes one way and sometimes the other.

Q. Counsel for Kansas when he cross examined witnesses in that State during the present month asked many witnesses as to their knowledge of what is called the Eden flood which occurred on Au-

gust 7, 1904, in Colorado, and its effect upon the Arkansas river in Kansas. Will you state from your records of the river flow what, if any, influence the flood known as the Eden floood on August 7, 1904, had upon the river in Kansas?

A. I have found no particular effect. To illustrate with Coolidge, a station in western Kansas: The Eden flood, so-called, was on Sunday, August 7. Now, on Sunday morning, August 7, the same day, there was quite a rise in the river at Coolidge.

The Eden flood occurred on Sunday evening while the rise at Coolidge took place on Sunday morning. It rose to nearly 2,700 feet at Coolidge on Sunday morning. Of course that was not the water coming from the Eden flood, as it takes about three or four days from Pueblo to get water down there. Now, on the 10th that had decreased to 75 feet. On the morning of the 11th the river rose to 285 cubic feet per second of time. Now, that rise on the
6878 morning of the 11th might possibly have been due to the Eden flood—from 75 to 285 feet. That, then, practically answers as to its effect farther down in the State. At Garden City there was a rise on the 9th, which is the same as the rise that took place at Coolidge on the morning of the 7th, neither of them due to the Eden flood but one occur-ing pretty nearly the same day in the month. As to what influence was made upon the river in Kansas in the way of showing to a less extent as one proceeded down the river in Kansas than at the places I have designated, I would say, it would show less.

Q. Professor Carpenter, at the time of your former examination you introduced certain graphic maps as to crop productions in the State of Kansas. At least two of the exhibits I think were numbered "Complainant's Exhibits A–28 and A–29." I refer to them simply for the purpose of directing your attention to the same subject and wish to ask you whether you have made any investigation of the rainfall during any of the years covered by the period in which these graphic maps show the crop production in Kansas and whether you have made any comparisons as between rainfall and crop productions in the State of Kansas in any of those years. If so, state what the results of those investigations have been.

6879 A. I have made a comparison of the corn yields with the rainfall at the two United States Weather Bureau stations along the Arkansas river. These two stations are at Wichita and Dodge City. The record at Wichita began in the summer of 1888. That therefore enables a comparison to be made from 1889. I have therefore made the comparison at both stations from 1889. The year 1889 was, in Sedgwick county and that group of counties where Wichita is situated, an especially good corn year. The year 1902 was the next best. In taking the rainfall for the three summer months of June, July and August as being most instrumental in the production of corn, we have in 1889 a total rainfall of 16.4 inches for those three months. Each month was above the normal. In 1902 the total was 16.51 inches, also well dis-

tributed, each month being above the normal, but relatively more in August and less in June and July. Now, during that same period, 1890 and 1901 were relatively poor years in the yield of corn. The rainfall during those same three months of June, July and August in 1890 totalled 7.60 inches, and July was very much below the normal—less than an inch while the normal is nearly 3.2 inches. In 1901 the total for the three months is 8.60 inches, fairly well divided between those three months, but with June the lowest month relatively as compared with its normal, and the prior month of that same year, May, was very low. Now, 1897 was a moderately poor year in the yield of corn. In that year the
6880 sum of the rainfall was 7.82 for those three months, with August relatively large; that was above normal and the other two were considerably below normal. That relates to the group near Wichita. Now, Dodge City is in Ford county, and that is in what was classed as the second group of counties. The year 1889 was a relatively good corn crop year in the vicinity of Dodge City. At Dodge the rainfall averages about two-thirds for the whole year of that at Wichita. The normal for these three summer months for the series of years is 9.06 inches. In 1889 at Dodge City the total rainfall was 7.59 inches, pretty uniformly distributed between months, June having the largest. 1891 was another high year in the yield of corn. In that year the rainfall for those three months was 12.79 inches. Those were two good years. Now, 1890 and 1894 were two relatively low years, and also 1901 was a low year in production. In 1890 the rainfall for June, July and August totalled 4.67 inches; July of that year was very low. In 1894 the rainfall amounted to 5 inches even, with an exceedingly low August—only .15 of an inch, and each of the other months below normal; and the preceding May was also low. In 1901, each of these three months was below the normal, the total amounting to 5.15 inches. August was .71 of an inch, only about one-quarter of the normal, and the preceding May was about one-half of the normal. The normal
6881 for Wichita for June is 4.91 inches, for July 3.41, for August 3.25, making a total of 11.57 as the normal, derived from the observations since 1888. I might say that in determining that normal August, 1904, was not considered because at the time of making the calculations I did not have August; but that would not affect it materially. The normal rainfall for June at Dodge is 3.38, for July 3.18, for August 2.50, making a total of 9.06. This normal does not include August, 1904, for the reasons before stated, but that does not make much difference.

Q. In your former testimony you stated the average flow of the Arkansas river at Cañon City, Colorado, for a year as being about 750 cubic feet per second of time. Can you state over what period observations were had to arrive at that and can you make it a little more definite than "about" 750 cubic feet per second of time?

A. This period extends from 1888. At the time of giving that

testimony the normal as so given was correct, and it is practically so now. That was given in October and the full record of 1904 of course was not then available. The year 1904 was below the normal, and that has slightly reduced the normal. Including all of 1904, the normal for the series of years, which is 17 years, is 738 cubic feet per second.

6882 Yes, sir, I have had measurements of the flow of the Arkansas river at Wichita and at different places for the year 1904, and I have heard the testimony of the witnesses introduced by the State of Colorado. From all of these sources, comparing the flow of the river in eastern and southern Kansas for the year 1904, not in figures, with the earlier years, I would say, 1904 seems to have been a larger year than a number of the previous years. Of course our own records only go back to 1903, though we have weather bureau records for some years prior to that.

The average flow of the river at Cañon City for 1904 for the whole year was 588 cubic feet per second of time. This is below the normal, which I have just stated as 738 feet, so that it is more than 20 below the normal. It was below the normal in most of the months—that is, in March, April, May, June, July, November and December it was below the normal. In August, September and October it was a little above the normal—in one case by 140 feet, in August, by about 80 feet in September, and by about 180 feet in October.

6883 If there were no ditches taking water from the Arkansas river between Cañon City and the Colorado-Kansas line, taking the year as a whole, as to whether the river would gain or lose materially between those two points, I will say, I think the river would lose.

If in the amended bill filed by Kansas it is alleged that the average flow of the Arkansas river for ten months in the year at the Colorado-Kansas line, if no interference was had with the river above that point, would be in excess of 2,000 feet per second of time, as to what I could say as to the correctness of that statement from my knowledge extending over a period of 17 years as to the average flow at Cañon City, I would say I think that would be largely in excess of the actual amount; and as to what my judgment would be as to the flow at that point, relatively, and as to whether I could give it within 50 or 100 cubic feet, I would say, I don't know as I could get it within that amount. I could state some of the conditions, some of which are conflicting.

6884 Q. It would seem that one who had given attention to the flow of streams might be better able to give a conclusion than one who had not, and so if it is possible I would like to have you give your best judgment as to what that would be, whether it be a close approximation or not, from all you know of the conditions, and then you can state what you base that on if you desire to do so.

A. Without the ditches the river would lose materially from 60 miles east of Pueblo, and of the amount of water which passes Cañon

City at a good part of the year, a very small proportion of that would reach the State line—almost none. What amount of that might be contributed by the Purgatoire, the data is exceedingly meagre. We know that it comes principally in times of floods, and the data as to that amount is almost too small to make a basis for a very good estimate. Now, of the amount flowing by Cañon City, the probabilities are that not more than one-half would be shown at the State line without the inflow from seepage, and of that from the Purgatoire and those side channels, my inference is that that would not materially increase the river. The early travelers at times found the river discharging into the Arkansas river; but taking those into account I should not think they would add more than a couple of hundred feet on the average. They would run, of course, a good deal larger amount at times, and at other times they would practically not have any; so that would seem to bring the amount

6885 say from 300 to 500 feet.

As to an average flow of five or six hundred cubic feet per second of time being a fair or liberal average for the amount crossing the State line if the river were uninterfered with by ditches above, I would say, it seems to me that would certainly be a liberal allowance.

As to whether there are any ditches or canals taking water from the Arkansas river or any of its tributaries in the State of Colorado at this time or have ever been at any time that are owned and operated by the State of Colorado, I would say no, sir, none that have ever been in form to carry water. As to whether there are any in form to carry water or any where near in such condition as to make them available for the diversion of water, I would say no, sir. As to whether as State engineer I was in touch with other branches of the State government as to the water matters and the administration of the water matters of the State, I would say that as State engineer I had charge of the water matters of the State, and usually knew of matters that were under consideration, and as to whether I knew or now know of any projects in hand by the State of Colorado looking to the diversion by the State of the waters of the Arkansas river and its tributaries, I would say, no, sir.

6886 Yes, sir, I was present at a large number of hearings in this case and have heard many of the witnesses testify. Yes, sir, I have noted in the testimony offered by the State of Kansas and also by the State of Colorado in Kansas, that many of the citizens of the western part of that State have testified that the rains which have fallen in that State of late years have appeared to be better distributed and better adapted for the growth of crops than in the earlier years.

During the spring and summer months, as to the direction of the prevailing winds in eastern Colorado, especially along the Arkansas river valley, I would say, well, the prevailing winds through all that section are from the west or southwest. That direction is such as would correspond with the general movement of the air in this

latitude, that is to say, in Colorado in general and other places in this latitude. There are sometimes local causes that will make a little variation, but that is the prevailing direction. And that would extend into western Kansas, yes, sir. Yes, sir, I also heard the witnesses introduced by the State of Kansas testify that the hot winds had been much less prevalent in late years than for-
6887 merly. As to whether the evaporation from two or three hundred thousand acres of irrigated land along the Arkansas river would amount to any considerable addition to the moisture of the area in that locality (objection), I would say I have carried on measurements in evaporation for quite a number of years, and the evaporation for several hundred thousand acres of ground under irrigation would be considerable. During the time it is wet in irrigation the evaporation would be greater than from a water surface of the same area, and of course after the water then had gone down from the surface it would be at a less rate. During June, July and August or other months when irrigation is practiced, which begins in the Arkansas valley a little earlier, say in May, June and July, the amount of land wet would be considerable and it must yield to the atmosphere a large amount of water in the aggregate.

As to what amount of rainfall is deemed adequate for the production of ordinary crops such as corn, wheat, oats and the various crops of that kind, of course that is a question partly of distribution and of latitude as affecting climate. A rainfall coming at the proper time would be more effective, and therefore less rainfall that
6888 fell in the proper months would be sufficient than if it fell in the winter months, for instance. It has very frequently been taken as 20 inches; that is, that the limit of successful agriculture is often put at that amount. That is an arbitrary line, and it cannot be absolutely fixed, but it reaches a point where agriculture becomes precarious at any rate when it is less than that. Yes, sir, that arbitrary limit so fixed would apply as well to a latitude such as that of the State of Kansas as to other latitudes. That limit of 20 inches was first stated publicly, so far as I know, by Major Powell in his monograph on the arid lands, some twenty-five or twenty-six years ago, and I have always had that in mind since, and it has been a very convenient and accurate statement, I think, of agricultural conditions.

As to where would be a line across the State of Kansas on one side of which line the annual rainfall would equal 20 inches and on the other side would be less, approximately, I would say the average rainfall at Dodge is very close to 20 inches—20.09 was the normal up to and including July of last year, dating from 1874, in October. Taking the territory east of a line drawn through Dodge City, as to whether the rainfall would be greater or less, I would say the rain-
fall in general increases as you go east and diminishes as you
6889 come west. Of course in some years there are exceptions. The rainfall varies considerably. There has not been one of the regular weather bureau stations for the keeping of rainfall

records in Reno county, Kansas. There has been a volunteer at Hutchinson, I believe, for a few years, and as to the average rainfall for a year at Hutchinson, I would say that in 1903 the amount was 27.63 inches, and that, from the general normal map prepared by the Kansas weather service, must be very close to the normal for that place. As to whether that amount of rainfall in that latitude is generally considered by observers and those familiar with rainfall and its effects upon the crops sufficient to produce the ordinary crops such as corn, wheat and the various farm products, I would say, yes, sir. The distribution during the summer months is such as to make the rainfall most effective, because the rainfall of May, June, July and August is a great deal greater than during the other months of the year. In other words, its effectiveness is large for its total amount.

Yes, sir, the lands called the reformatory lands mentioned by the amended bill filed by the State of Kansas in this case are situated near the town of Hutchinson. I think they are in town. I
6890 know they are what I supposed to be within the city limits, but that may be wrong.

Yes, from Hutchinson south and east along the Arkansas river in Kansas the annual rainfall increases over that shown at Hutchinson. Taking the distance along the valley of the Arkansas river in Kansas as 310 miles, as stated in the amended bill of Kansas, as to how many miles, about, of that valley lie within a region having 20 inches or more of rainfall, I would say Dodge City, which is at a point where the rainfall is 20 inches, is about 120 miles from the Colorodo State line, so that it is a little more than one-third of the distance along the river that has a rainfal of less than 20 inches, and about two-thirds of it has more than 20 inches.

As to the dates of the earliest ditches for irrigation in Colorado, excluding those of prehistoric times, so far as my investigations have gone I would say about 1858 or 1859; that is, we know that there were some that have been proved up as of that date; and yet I perhaps ought to qualify that by saying that there were some communities in Colorado that we know of earlier than that date that were irrigating, but I don't know that their dates are on record definitely. Those are what might be termed the Anglo-Saxon ditches.

6891 In the valley of the Arkansas river in eastern Colorado, as to whether we find a water table or ground water similar to that which is found in Kansas and western and middle Kansas in the valley of the Arkansas river, I would say we strike ground water, yes, sir. The sheet water that is spoken of in western Kansas is not as prominent or has not been known as much as that in eastern Colorado, partly, I presume, if not largely, because there were no settlers in there making attempts to dig wells to any extent prior to the time of irrigation. Yes, sir, the irrigation itself would affect the ground water. In a portion of eastern Colorado as in western Kansas above ditches where they have wells it is quite a depth to

water—from 40 to 100 feet—and that has been outside of the range of all the testimony that has been presented. By "outside of the range of all the testimony" as to whether I mean outside of the range of settlement when you get beyond the ditches largely, I will say pretty largely so, yes, sir, in Colorado, though there have been some wells in eastern Colorado and western Kansas, both.

I think I am in a general way familiar with the requirements placed on settlers under the preemption and homestead laws as to living on property and the various things required of them, yes, sir; and as to the possibility of complying with the requirements of the preemption and homestead laws in Colorado or the truly arid region if the right to use water for irrigation were denied, I would say it would simply be impossible to make a home upon the land, with very few exceptions.

6892 Q. During the recent hearings in Kansas a number of witnesses were interrogated upon cross examination by counsel for Kansas in reference to a certain pontoon bridge built at or near Oxford in the State of Kansas. I hand you a book and ask you to state what it is, and if there be any reference to said bridge there I would like to have you read it (handing book to witness).

A. This is a quotation from executive document 94 of the House of Representatives of the third session of the Forty-fifth Congress. In that there is a reference to the pontoon bridge at Oxford, at page 9, in a report of Mr. J. D. McKown, assistant engineer, to Major Suter. This is dated January 27, 1879, and in his report on the Arkansas river he states:

"At Oxford there is a pontoon bridge. A roadway built to it is made of rock, brush, and prairie hay, the latter predominating, and seems to make an excellent dyke, closing the river in to about 150 feet, and making a good channel along the bluff for about a half mile."

As to whether I have made any comparison of the area of land under irrigation in Colorado with the area under actual cultivation in some of the other States of the Union where irrigation is not practiced, I would say I have, and as to the result of such comparison, I would say I have gotten figures from the census re-

6893 port of the 12th Census on agriculture in which it states, page 692, that the acreage of improved land in Colorado is 2,273,968—approximately two and a quarter million. Now, from the same report the area of improved land in both Massachusetts and Connecticut is very nearly the same—2,357,000, that is, together. In other words, the area of improved land in Colorado is almost the same as the area of improved land in both Massachusetts and Connecticut. It is but little short of that in Vermont; it is more than the improved land in New Hampshire; it is nearly three times the area of improved land in Delaware; it is one-half more than the area of improved and in Florida. Now, in the United States, the census gives the area of land irrigated, the total being about seven and one-half

million acres. That acreage is also as much as all of the improved land in New England; that is, while the acreage of irrigated land at present, or in 1900, was practically seven and one-have million acres, all of the improved land of all the six States of New England footed up to but 8,134,000 acres, hence at that date, 1900, the land actually irrigated was practically equivalent to all of the improved land of New England.

Q. You say "practically equivalent." If the word "practically" is used in the sense of productiveness, it would bear even a stronger statement, would it not?

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A. Much more so. I speak of the acreage and not of its productive capacity. Now, in the meantime, in five years, of course the area in the West has increased, so that the area of irrigated land as increased would probably by this time equal or exceed all of that amount, and in the future, with the water supply we have, it would very much exceed it.

As to my having another line of wells which illustrates the comparative uniformity of the level of the surface of the ground and the level of the surface of the water underneath the ground, I would say I referred yesterday to the lines at Hutchinson running twenty-six miles northeast and twenty-three miles southwest. I have here the map of that line and the cross-section of the country showing the surface elevation and the ground water surface also.

6895

(Defendant Colorado's Exhibit 31, just referred to, was here identified by the witness.)

This map shows on the upper portion thereof the section lines, the lines of railroad, and thus the map of the route followed, which was along the railroad. The lower diagram shows the profile. There are two lines shown in the profile. The upper one is the ground surface. Its rises and falls show the rises and falls in the surface of the ground. The second line, approximately conforming to the ground surface, is the water surface of the ground water as revealed by the wells which were sunk at different points along this forty-nine miles.

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Q. The second line you have just spoken of appears on the present map, Exhibit 31, in red. In preparing a map to be used in the case could you designate that line in some way to distinguish it from the first or upper line so that it could appear in print?

A. To be shown in one color, that will be distinguished as a dotted line.

Mr. DAWSON: We ask leave to substitute in place of this particular map one identical with it except that the second line referred to now appearing in red will be made in the form of a dotted line, so that it may be reproduced in black and white.

A. (Continuing:) This profile shows the valley of the Arkansas river and the valleys of several other streams crossed by the line, as

the Little Arkansas, the creek at Medora and several other small creek valleys. The noticeable points are, the elevation of ground between Hutchinson and the Little Arkansas, and the corresponding rise in the ground water at that elevation of ground, so
6897 that the ground water rises there 60 to 70 feet above the lowest part of the valley at Hutchinson. The vertical scale is shown at the side of the diagram, in feet, above sea level. It is exaggerated, as is customary, and as it is necessary in profiles in order to show variations of the surface.

Yes, sir, the prevailing eastern opinion seems to be that Colorado is nothing but a mining State. As to whether I have had occasion to examine any sources of information for the purpose of determining the rank of Colorado in the production of such minerals as gold, silver, coal, etc., and for the purpose of comparing the total mineral products of any given year with the agricultural and ho-ticultural products, I would say I have made such a comparison from the figures available. In the case of gold and the minerals (objection), the Government prepares a report annually on the mineral statistics of the United States. In gold Colorado ranks as first of all the United States in its production; in silver it also is number one, and in coal production it ranks as number seven. Now, the agricultural productions of the State, from the comparisons that are made almost every year and with which I have at times had something to do in attempting to get at the figures, exceed the mineral products of the State, both the sum of the gold and the silver and the coal.
6898 Yes, sir, in using the term "agricultural" I include in that horticultural products. I mean by that agriculture in its broader sense.

Q. Professor Carpenter, in certain testimony offered by the Federal Government at Santa Fe, New Mexico, reference was made to the Rio Grande, and among other things some of the witnesses attempted to state the influence the irrigation in Colorado on that stream has upon the flow of the stream in New Mexico. I wish to ask you some questions in regard to the Rio Grande. I would like, however, to state in doing so that counsel for Colorado still wishes to stand by the objection made at the time as to that part of this testimony, and to state that no opportunity has been had since the taking of said testimony to properly or fully investigate the matters there inquired into which at the time were objected to, and that prior to the asking of said questions so objected to counsel for Colorado had no way of even expecting that that matter would be gone into. Have you had any occasion to investigate any part
6899 of the Rio Grande? If so, when and to what extent were those investigations carried on?

A. I have had occasion to investigate the Rio Grande. I was first in the valley of the Rio Grande in 1882, and have been almost every year since with the exception of the last year. During 1889 I visited a large part of that valley in collecting information in regard to the ditches. About 1895 or 1896 I began

an investigations of the conditions of that valley in connection with investigations for the experiment station in pursuance of a general plan of investigating the irrigation and water resources of the State. One of those summers I spent a large part of in the valley and had an assistant there who spent all summer. That is in the San Luis valley on the upper Rio Grande. That led into certain questions that caused a development of the inquiry, and I subsequently went and had measurements made of all the streams running into the valley on all sides, which required a wagon journey of 2,000 miles. That was done for several years. I also went in pursuance of the same general inquiry a number of times into New Mexico as far as Espanola, and in 1899 or 1900 I went with a party down the cañon, or tried to, from Antonito, where the river cañons, for some distance down that cañon. In three days we succeeded in going fifteen miles, and then we came from the lower end of the cañon at Espanola up quite a good many miles, all of which was done for the purpose of investigating the general conditions. I have been down the river by rail from Albuquerque to El Paso quite a number of times, and a part of that was in connection with the United
6900 States artesian well investigation, which investigation I had charge of in New Mexico, in my territory, and I then had cause to become acquainted with the conditions of the river in hearing a good deal of the so-called Elephant Butte case, in fact hearing all of the testimony at that time.

Yes, sir, I have made investigations of historical writings in reference to the Rio Grande, and I have found that the river went dry in the years before irrigation was commenced in Colorado, in the Territory of New Mexico. I have here references to a few of those years, only a few of the historical references to the Rio Grande that I have at present, but some. The first refers to the year 1542 and is from the account by Castaneda of Coronade's expedition. A translation of that is given in the fourteenth annual report of the Bureau of Ethnology, 1892–1893, part I, page 511. It is in chapter 22 of his account. To preface two or three sentences, this account refers to a trip of a captain who went from their headquar-
6901 ters, which was at Tiguex, which was a little above the town of Albuquerque, about Bernalillo, and from the context it would seem that it must have been about August. That is not clearly stated. And it is to the effect that the river went dry. The quotation is as follows:

"Another captain went down the river in search of the settlements which the people at Tutahaco had said were several days distant from there. This captain went down 80 leagues and found four large villages which he left at peace. He proceeded until he found that the river sank into the earth like the Guadiana in Estremadura."

This same account is given in a recent book by Winship on Coronado's trip, which largely is a reprint of this same translation. Now, in Senate document No. 229 of the Fifty-fifth Congress, second

session, is a compilation by Mr. Follett of conditions of the river at a number of places and for a number of years. This document was also reprinted in the "Proceedings of the International Boundary Commission, United States and Mexico; the Equitable Distribution of the Waters of the Rio Grande"; volume II. In the Senate document referred to, page 90, in 1851, it states as follows:

"There was another year between 1861 and 1879 when the river was dry, but I am not able to locate it."

Then there are a number of other years whose characteristics are more fully given. Thus, in 1879 the river was high at Del Norte; it was dry for two weeks at Los Lunas, six weeks at Socorro, six weeks at San Marcial, and at Las Cruces from the end of July to the end of October.

6902 From my investigations of the Rio Grande, as to the characteristics of the river and whether it has any points of similarity with the Arkansas river, I would say, it is a stream in which there are very great losses. It is a stream of the type of that characterized in the examination last fall as mountain streams, that is, with perennial tributaries near the head and no more perennial tributaries for a great many miles. There is therefore a long distance of non-productive territory—longer in the case of the Rio Grande than the Arkansas, as the Conchas, rising in Mexico, is really the first perennial tributary for a long distance, and the stream loses water for a great part of its course. That was shown from a comparison of the records at San Marcial and El Paso, and more recently by a trip by the Government engineers, to be of the same character as those in which we have made seepage measurements in Colorado. That is reported in this same International Boundary Commission report and shows that of the water pas ing San Marcial at that time sixteen per cent. reached Loma, the head of navigation. The stream differs from the Arkansas, it might be said, in one respect, in that the valley is generally relatively a narrow one and very frequently cañons up, and for a long distance, so that it has deep cañons, almost impassable, some of considerable length in New Mexico and still longer ones on the border of Texas, so that I think but one or two parties have ever descended the river, as it is a rock-bound cañon a good deal of the way. Nevertheless, but sixteen per cent. of the water passing San Marcial has reached Loma.

6903 As to whether my investigations have gone far enough to enable me to state with any accuracy the influence which irrigation in Colorado has had upon the Rio Grande, I will say, no, the measurements there were not such as to determine that point with certitude, in fact they were not directed toward ascertaining that point. We haven't a series of measurements. There have been measurements made at Embudo and at Del Norte, and after my summer in the San Luis valley a station was established at Conicero. I put a gauge rod that summer at this place, but no one lived at that time within a good many miles of there. Afterward

I believe the Governmemt put a station there when someone had established a home near by. In the cañon above Embudo there is a noticeable increase in the river above that, up at the head of the cañon, an increase that is very noticeable to the eye, but they do not have a series of measurements there, and I made no measurements.

Since the taking of testimony in this case in Santa Fe, New Mexico, in February of the present year, I have not had the time or opportunity, in addition to the other investigations that I am carrying on, to make investigations of this stream or of conditions there.

This would be an unfavorable season of the year, up to this
6904 time, to make any investigation in that region, even if I had the time. It is at a high elevation, almost impossible of access, it would have to be miles from any habitation and through a country that is pretty difficult to go through at any time. As I say, on my trips through the cañon we were scarcely able to go fifteen miles in three days.

As to what has occurred, if anything, on the headwaters of the Rio Grande or its tributaries in Colorado with reference to the timber conditions, I would say, the timber on nearly all those mountains of the west has been cut off to a very great extent, as it has on all the other streams in this State; and as to whether the changes in character and time of flow follow in a general way the cutting off of the timber on the head of this stream as the changes which I have described as following a like destruction of the timber on other streams in Colorado—the Arkansas for instance—I would say undoubtedly; and there has been during the past few years, up to probably the past year, quite a shortening of the rainfall. I have had a rainfall station near Monte Vista part of the time, or a good deal of the time since 1888. That was a substitution experiment station, and that

was situated in the San Luis valley in Colorado and close to
6905 the Rio Grande. That is about fifteen miles from Del Norte, where the river comes out of the noticeable mountains, so that the rainfall there was impressed upon me and I paid some attention to that aside from my other interest in the valley. I have known of the fact a few years back that there has been a considerable shortening of the rainfall—and by "a few years back" I mean for the past four or five years anyway, and in fact the high year which they referred to runs back quite a number of years ago. There was one high year some time in the '90's, but the last four or five years the crops have been short—those I refer to more particularly.

Yes, sir, that is about as definitely as I can go into the question of the Rio Grande at this time from my special investigations.

Yes, sir, I have made examination and search for historical references to the ancient practice of irrigation in the arid region of the United States, and through the help of Mr. Daniels, the librarian of the agricultural college, we have made an examination of a good many documents which might throw light upon the extent or the existence or the limits of ancient irrigation.

Q. Will you state some of the matters that you find in reference to that and call attention in some instances to the places
6906 where such reference may be found?

A. There are a very large number of books and documents which have more or less to say about ancient irrigation, and there is an enormous mass of material, so much that it is hardly necessary to more than refer to it. Almost any work which bears upon the Indian races of the southwest, upon the cliff dwellers, or upon the early history, or pre-historic conditions, have more or less to say of the irrigation. It was known, of course, that this country was inhabited by a population; that that population was largely agricultural through that section, and that so far as it was agricultural it had to depend upon irrigation, and did; that there are remains of irrigation works in various places in Colorado, principally in the southwestern part, in Mexico and in Arizona, and those are described at length in a good many of those books. Of those treating at times upon this subject I might mention classes of books like the reports of the Bureau of Ethnology, and such as "Bancroft's Native Races." Bandalier has several works, and long quotations could be given. For instance, in Bandalier's Final Report of the Investigations among the Indians of the Southwestern United States, in two volumes, Cambridge, Massachusetts, 1890, I might quote from page 436:

"Ancient irrigation ditches are frequent, and of considerable size, they run mostly parallel to the streams, but transverse acequias have also been discovered. I refer to the Preliminary Report of Mr. S. H. Cushing on the work done by him for the Hemenway Expedition."

6907 Then the foot note on preliminary notes, page 168:

"These canals in the Salado and Gila valleys we found to vary in length from ten to eighty miles and in width from ten to eighty feet, with a depth from 3 to 12 feet. Each canal, whether large or small, was found on excavation to have been terraced; *i. e.*, the banks of dirt thrown out in its excavation had formed, as it were, a greater canal containing a lesser, which in turn contained yet another."

That terracing is what engineers now speak of as a berm.

Then on page 437 of Bandelier he refers to a long and wide ditch near Tempe, reported to be cut through solid rock, but does not give that on his own authority. This last quotation is from Bandelier and is given in the papers of the Archeological Institute of America, American series 4. A large number of quotations could be given. Bandelier quotes on page 388 of the same volume from the Annual Report of the Chief of Engineers 1879, Part III, Appendix "00", page 2220, from Lieutenant Rogers Birnie. I have not verified this quotation, but give it because of its showing the long existence of such irrigation.

"A Mexican living at Tule spring is now using to irrigate his land a ditch of stone. The water used is derived from the Tule spring,

and the ditch has been so long in use that it is, so to speak, fossilized. The present owner knows nothing of who made it, and, with reason, attributes it to the old inhabitants. Lying on the surface of the ground near by are the segments of troughshape stones being in position for 100 yards or more."

Stephen D. Peet has a work upon "The Cliff-Dwellers and the Pueblos," in six volumes. Volume III, chapter 17, is upon prehistoric irrigation, almost all of which relates to this subject. There are a good many others that have references, but those are summed up very largely in this one of Peet's.

6908 There are two other references to ancient irrigation that may be good. The first is from Buckay O'Neill in an article on "Arizona's Ancient Irrigators" in the "Irrigation Age" of May, 1891, page 26, first column. He states:

"The greatest souvenir left by the aboriginal races of North American is to be found in the immense net-work of prehistoric irrigating canals that gridiron the Salt river and the Gila valleys of Arizona."

In the second column he states:

"It was these ruins that in the early '70's gave the American settlers the idea of reclaiming the valley where now stands Phœnix, the capital of the Territory, * * *, the first canal constructed simply following the line of a prehistoric one. How extensive the entire system of irrigation in the Salt river alone was may be inferred from the fact that the amount of land practically covered by canals was over a quarter of a million acres, nearly treb*el* the area of the lands at present actually within the county of Los Angeles, California * * * The canals themselves with their principal laterals must have exceeded a thousand miles in length, and the ruins of many of them give vast evidences of the vast labor of their construction. Chief in this respect is without doubt the canal at present supplying Mesa City and vicinity with water required for irrigation. This acequia, now known as the Mesa canal, is taken from the south bank of the Salt river about twenty-five miles east of Phœnix, and after leaving the river runs for several miles through a formation of hard, volcanic rock. So far as known, without explosives of any kind and with the simple tools of a stone age, the aboriginal constructors of this ditch excavated it through the rock to a depth ranging from twenty to thirty feet. The width of the canal is about twenty feet and its capacity with the ordinary amount of water in the river would probably be ten thousand to fifteen thousand inches."

6909 Cosmos Mindeleff on the "Aboriginal Remains in Verde Valley, Arizona," in the Thirteenth Report of the U. S. Bureau of Ethnology, describes some irrigating ditches at length. On page 259 he speaks of the immense number of ruins and immense population, as high as 500,000.

J. R. Bartlett, in a book called "Personal Narrative of Explora-

tions and Incidents in Texas, New Mexico," etc., in two volumes, published by Appleton, New York, 1856, says:

"The town of El Paso Del Norte is situated on the western bank of the Rio Grande in the northeastern corner of the State of Chihuahua * * * At the time of the advent of the Spaniards, the Piro Indians, who occupied the valley extending as far north as Taos, had a village sinecu * * * Between two and three miles above the plaza, where the river forces its way through the mountains, there is a dam, the object of which is to raise the water and divert it into acequias or irrigating canals which conduct it through the bottom lands on both sides of the river. The principal of these canals, called Acequia Madre, is about 15 feet wide. From it smaller ones branch off in every direction."

As showing the view in which water was held, I might quote from Coronado in a letter of Coronoda to Mendoze, dated August 3, 1540, which is given in the 14th Annual Report of the Bureau of Ethnology, part II, page 561, at the bottom of the page:

"So far as I can find out the water is what these Indians worship, because they say that it makes the corn grow and sustains their life, and that the only other reason they know is because their ancestors did so."

No, sir, this last quotation does not refer to Indians in the locality which has been covered by the quotations I have been reading in reference to irrigation canals. This is more particularly from the Rio Grande. And this from Coronado is from that region, although I have not verified that exact location. Yes, sir,
6910 that is in the irrigation country. It is in the southwestern part of the United States, in all this country where climatic conditions require irrigation.

Yes, sir, in my testimony last fall I stated that the drainage area of the Arkansas river and its tributaries in Colorado was approximately 26,000 square miles, and that the drainage area of the river above Cañon City was only about 3,000 square miles. As to whether I can state approximately the drainage area of this river above an elevation of 9,000 feet, I would say, it is 900 square miles. I would say that this is taken on the basis of Hayden's map, which is on a small scale and it is rather difficult to follow the contours that are there shown, and so this is an approximation, not so good as the total area, because there we could use the maps on a good deal larger scale for a good portion of the water shed. As to whether I have had those skilled in working upon maps engaged in figuring this carefully, we have gone over it as closely as that could be done. That line of 9,000 feet elevation was taken as an elevation to determine the area above because below that line the water shed is almost entirely denuded, and as a matter of fact there are large areas above that elevation that are of comparatively little importance so far as perennial flow is concerned.

6911 Yes, sir, it is true that in a considerable part of that above 9,000 feet even in the valley of this particular river the snowfall is not particularly heavy and it does not lie upon the ground; that is, it is unprotected from the action of the wind and sun. As to whether I have any way of estimating the area in approximate figures that would lie say above ten or eleven thousand feet without a great deal of figuring, I would say that compared with the areas of the Rio Grande in Colorado we might expect about 150,000 square miles.

As to whether I know of anything that the State of Colorado is now doing or has been doing in the last several years in the way of construction or operation of ditches by the State which threatens to wholly exhaust or to any extent exhaust the flow of the Arkansas river in Colorado, I will say I do not.

From my investigations, as to whether that which is described in the amended bill filed by Kansas in this case as the "underflow" is in my judgment a subterranean stream flowing in a known or well defined channel, or merely water percolating through
6912 the strata below, I would say it is not a stream but in my judgment it is simply percolating water.

Yes, sir, all the lands in Colorado which have been described as irrigated with water from the Arkansas river and its tributaries are dependent upon waters from that river or its tributaries to make them productive in agricultural crops. They are all so dependent.

As to whether I can add anything to what I have stated as a witness as to the possibilities of the maintenance of a sustained flow of the river through the control of its flood waters or through the control of what might be termed "high" water in the river, I will say I don't recollect having said anything particularly on that line; but of course every ditch or reservoir that takes water at high water will to some extent control the floods, and as to what effect it will have if spread upon the lands in regard to the low water flow
6913 of the river below the point of its use, I would say with that applied to land it then forms a reservoir of the land and the water gradually goes back to the river, or a material portion of it, and helps to maintain a sustained flow in the river below.

(Defendant Colorado's Exhibits 1 to 31, both inclusive, offered in evidence.)

Cross-examination.

By Mr. ASHBAUGH:

When I testified last October I was State engineer of the State of Colorado. I have been State engineer one term. My time has expired and I have not been reappointed. The present State engineer is Mr. Thomas W. Jaycox. After my direct testimony was taken last October I didn't have it printed, but the testimony has been printed.

6914 In getting the elevations of cities in the State of Kansas, in many cases I have used Gannet's Dictionary of Elevations, published as Bulletin 160 of the United States Geological Survey, the third edition, dated in 1899, which edition I now have in my hands. It is a compilation, but is as good in most cases as any data we have at hand. Yes, sir, I will give you, from this dictionary, the elevations asked for, which are as follows: Coolidge, from the Santa Fe railroad, 3,848 feet; Syracuse, 3,227 feet; Garden City, 2,836 feet; Cimarron, 2,625; Dodge City, 2,484. These are the Rock Island elevations, while the others above are from the Santa Fe records. Kinsley, 2,171; Larded, 2,002; Jettmore,
6915 2,268; Great Bend, 1,850; Scott City, 2,971; that is, this is called Scott, but I suppose it is the same; St. John, 1,915; Dighton, 2,761; Lacrosse, 2,061; Ellinwood, 1,789; Sterling, 1,644; Hutchinson, according to the Santa Fe Railroad elevations is 1,533; Buhler, 1,474; McPherson, 1,497; Medora, 1,484; Burrton, 1,457; Halstead, 1,388; Sedgwick, 1,377; Valley Center, 1,348; Wichita Heights, 1,331; Wichita, Missouri Pacific railroad, on the authority of the Missouri Pacific railroad, is 1,202; Wichita, Santa Fe railroad, 1,300; Wichita, Rock Island railroad, 1,297; Oxford,
6916 1,163; Eldora, 1,291; Augusta, 1,221, Winfield, Santa Fe railroad, 1,121; Kingman, 1,504; Pratt, 1,485; Greensburg, 2,235; Arkansas City, 1,073 feet.

In running the lines of wells I have testified to yesterday and today and in taking the measurements of those wells, as to how many of those measurements I have made myself, I will say that I have made none of them personally. Perhaps I ought to qualify that. There have been some of the wells that I have been to and made some measurements, but of those that I testified to, I think those were made by assistants working under my direction. No, sir, they were not State officers, they were simply persons employed by me to do the work, and simply made reports to me whenever convenient. As to whether these measurements have been going on ever since my testimony of last October, or since the testimony began at Wichita in August, I will say some wells were put down in the latter part of August and the measurements have been continued on those ever since and they have been increased in number and more ex-
6917 tensive measurements have been made. I think I have mentioned or reported nearly all of the measurements that were made and reported to me.

No, I think the Burrton-Halstead line of wells and the Colwich line of wells and the Mount Hope line of wells are not practically the same wells that I spoke of in my testimony in October. It is the same line at Colwich, and I think we extended the line at Mount Hope, but that is the same line of wells and was taken to indicate the same line and includes others than were then referred to. No, sir, no variations were made from those two lines of wells referred to by me in my testimony of last October at the Mount Hope and Colwich lines.

There is a Coon creek near Kinsley, and it rises southwest of Kinsley. Taking it from the land office map, a branch seems to head near Spearville, which is about fifteen miles from Dodge.

The topographical map would put that on a larger scale, but
6918 I suppose that is close enough to what you want. I don't know of my own personal knowledge of another branch rising west from Spearville and near Dodge City. It doesn't show on this land office map. Yes, Rand & McNally's map which you hand me shows a branch running near Dodge City. Coon creek for a distance of eight or ten miles is quite close to the Arkansas river, running a part of the way between the river and the bluffs, and I think it must be ten or fifteen miles that it follows within a mile or at least two miles of the Arkansas river. I don't know exactly from this land office map how long Coon creek is, but apparently something like thirty miles. Yes, the Rand & McNally map would show it to be something like forty miles. Yes, sir, it follows along the north bank of the Arkansas river to the town of Garfield and there empties into the Arkansas river. As to whether Coon creek
6919 or the Arkansas river for a number of miles along there is the higher, I will say I have a line of levels across Coon creek at one place, otherwise I cannot answer except from the contour map. On the 10th of this month Coon creek, where it crossed the road east of Kinsley, was above the river on the same line; that is, the water in Coon creek was above the water in the river, about .4 of a foot, and that must be about three-quarters of a mile back from the river. As to whether there are any other places where the waters of Coon creek are above the waters of the Arkansas river, I will say I think that is the only place I have a definite level of. I don't know whether there is any place where the waters of Coon creek are below the waters of the Arkansas; that is, I have no measurements showing that. As to which way the land slopes from the source of Coon creek down to its mouth, between the Arkansas river and Coon creek, I will say from the topographical sheet published by the Geological Survey, opposite Spearville, that is, between Spearville and the river to the south and west of Spearville, the portion next to the Arkansas river slopes toward the river.. That is a strip that is two or three miles wide; then to the north of that a portion slopes toward Coon creek. On the north side of Coon creek it
6920 slopes toward Coon creek, that is, to the south. Yes, sir, the land on each side of Coon creek for a certain distance slopes toward the creek.

Yes, sir, Jettmore is on the Pawnee river. The fall of the Pawnee river from Jettmore to Larned is 266 feet and the distance is approximately between 40 and 45 miles. As to whether the fall of Pawnee creek from Jettmore to Larned is greater or less than the fall of the Arkansas river for an equal distance up the river from Larned, I can only answer that by reference to the contour maps. It seems to be very nearly the same distance. Forty-five miles up the river by a rough measurement would seem to take you to a point

six or eight miles below the river from Ford, which is at the contour elevation of 2,260 feet, and Larned is given on the contours of these same maps as 2,000 feet, so that the fall is very closely the same either way. I think a line drawn at right angles to the general trend of the river at Dodge City and extended would pass
6921 very near to Jettmore. Yes, sir, Jettmore is 216 feet lower than Dodge City. Part of the way the land slopes from Dodge City toward Jettmore. From exact information I don't know whether the general level of the land at Jettmore is very much above the valley or the bed of the Pawnee.

We have an exhibit which shows a cross section of that valley a few miles west of Jettmore, I believe. As to whether the general level of the land is just a few feet above the bed of the Pawnee, well, I haven't that impression. I have the impression that that slope is pretty sharp toward the valley. I don't know how much above the river the town of Jettmore is. We have an exhibit that has been presented in evidence, Defendant Colorado's Exhibit 24, which is a cross section across these valleys, that is, the valleys tributary to the Pawnee, and the Pawnee is straight north of Dodge. That runs six miles west of Jettmore. The valleys which it crosses are quite sharply cut. That land from Dodge City to the Pawnee and immediately west of Jettmore crosses a number of drainage channels, and that is all drained into the Pawnee, yes, sir. As to
6922 how near any of those tributaries or drainage channels rise to Dodge City, I would say that those I have seen have not had water in them when I visited them, but the nearest channel running to the north is within six miles of Dodge, north, I believe. I think there is a little ravine that starts right north of Dodge and runs almost north—northeasterly. I think there is a creek known as Duck creek that enters into the Sawlog that itself enters into the Pawnee. The channel of Duck creek is still farther north, about six miles, and that rises west of Dodge, and both of these ravines drain into the Sawlog, which runs into the Pawnee. I have not traced these down, but from my remembrance of the condition that is the case. Yes, sir, the water flowing on the surface of the land two or three or six miles north from Dodge City would drain northeast into the Pawnee river. Yes, sir, there is one branch of the Pawnee that rises up near Cimarron, known as Buckner creek. There is a tributary there; I don' know where it rises. There is one tributary or one ravine draining into
6923 Buckner creek that seems to head about two miles from the Arkansas river, about one mile north and a little east of Cimarron. No, it is about four miles east and nearly two miles north. As to the land from Cimarron to Dodge and one or two or three or four miles north from the Arkansas river draining into the Pawnee, I would say, well, not so near as one mile, but from two to three or four miles, apparently.

As to the Walnut river rising and running along what is known as the divide between the Arkansas and the Smoky Hill, I would

say, I don't know about that region being termed the divide. I have never had occasion to notice that the Missouri Pacific railroad from Hoisington straight west through that series of counties
6924 runs on the divide between the Arkansas valley on the south and the Smoky Hill on the north. Partly all of the waters from the four counties of Scott, Dighton, Ness and Lane, and directly west of Barton county, drain into the Walnut. Part of each of these four counties seems to drain into the Smoky Hill, from the north part of the counties, yes, sir. Yes, that seems to be the case, that there is a divide running through the State of Kansas from Barton county west, the Walnut river being right near the divide and draining south and east into the Arkansas, while the north portion of all those counties drains north into the Smoky Hill.

The Land Office map does not name Rattlesnake creek at all.

Cow creek rises northwest of Hutchinson, the longest branch seeming to be in the extreme north of Barton county, north of Great Bend and a little east. Yes, it runs to the southeast, practically parallel with the Arkansas river, and its direction converges
6925 with that of the Arkansas. As to the bed of Cow creek being above the bed of the Arkansas river at a point reached by a line at any place drawn at right angles from the Arkansas river, I will say that at Ellinwood a line at right angles to the Arkansas river would strike Cow creek at the same elevation, as near as I can judge from the Great Bend topographical sheet. Opposite Sterling a line at right angles to the Arkansas river would cross Cow creek apparently at a lower elevation of possibly 20 feet. It may be a little more. If you take the same number of miles up Cow creek and up the Arkansas river from the mouth of Cow creek at Hutchinson, as to which is lower, Cow creek or the Arkansas river, I will say, opposite Nickerson a line drawn at right angles to the river seems to cut Cow creek at very closely the same elevation, possibly ten feet lower, taking this from the topographical sheet described as the Lyons sheet of the Geological Survey. In the upper part of Hutchinson, from the Hutchinson sheet it will appear that Cow creek is slightly lower than the Arkansas river at a point at right angles and directly
6926 opposite. As to how the land slopes from the Arkansas river on the north side between Hutchinson and Ellinwood, as to whether it slopes to the Arkansas river or toward Cow creek (objection), for some distance there is another small stream or valley known as Bull creek, and then above Sterling, that is, up the river, there is a strip several miles wide that seems to have very little fall at right angles to the river—practically none—so it is not clear from the map which way the water would flow. As we get in the vicinity of Raymond, then there is a strip three or four miles wide tributary to the Arkansas river proper, and that land north of that strip apparently drains toward Cow creek.

6927 The Little Arkansas river seems to rise in the southern part of Rice county or southeastern part of Ellsworth county,

near Geneseo. It flows southeastly, and practically parallel with the Arkansas river on the north side to the city of Wichita and there flows into the Arkansas river. As to whether the bed of the Little Arkansas river through its whole distance is above or below a corresponding point on the Arkansas river from Wichita, I will say, I cannot answer immediately to the full extent asked. At several places, as for instance opposite Hutchinson, at Medora, the Little Arkansas river is lower than the Arkansas river at Hutchinson. It is quite a little lower, I think about fifty feet lower. I have not consulted the figures, but from the profile I have I should think it was. I presume that is correct—that Medora is exactly 49 feet below Hutchinson, that is, at the railroad stations. Yes, sir, and at Buhler, six miles east of Medora on the Little Arkansas, it is
59 feet below Hutchinson, according to these figures. Buhler
6928 on the map doesn't seem to be on the Little river, but near it. We have the exact differences between the two rivers on the line of elevations shown by Defendant Colorado's Exhibit 31. As to how the land slopes between these two rivers from Hutchinson and Medora on the north to Wichita on the south, I will say that between Hutchinson and Medora is a divide which parts the waters that flow into the main channel and into the Little river. North of that divide the waters run into the Little river and south of it they run into the Big river. There is one branch of the Kissaway creek, or else the main Kissaway creek, rises southwest of Halstead. Yes, there is one branch of that creek that rises very near to the city of Hutchinson, within a mile or two to the northeast. I should say four or five miles, perhaps, from the center of the town. Yes, and
it flows a little south of east until perhaps five or eight miles
6929 north of Sedgwick and there flows into the Little Arkansas river. As to the Rock Island depot being due east of the Missouri Pacific depot on Douglas avenue in the city of Wichita and seven blocks away, I will say I don't know the number of blocks. It is on Douglas avenue or close to it and east of the Missouri Pacific. I presume that is the number of blocks; it is somewhere in that vicinity. Yes, the Missouri Pacific depot is on the east side of the Arkansas river and very near its bank, and it must be close to where the original bank of the Arkansas river was thirty years ago. According to the figures I quoted, the Rock Island depot is five feet lower than the Missouri Pacific depot. I presume that the compiler, Mr. Gannett, has adjusted these levels. They were made from the reports of the different railroads, and until I know whether he adjusted that I wouldn't know whether that meant that exact difference in elevation there, either one way or the other. You see what I mean is that the railroads as they are built bring in different
elevations. In the city of Denver, for instance, the roads
6930 disagree by about 50 feet.

As to whether the flood of July 7, 1904, flowed southeast through the city of Wichita, I will say, well, I don't know about that. The flood flowed south on the north-and-south streets, from the

photographs I have seen. On Douglas avenue I don't know how it flowed. I don't know that it flowed east on the east-and-west streets. As to the general trend of the land and the trend of that flood, I will say I don't recall that I have learned anything or have seen anything that has given me the impression of an east and-west direction there. Farther east I suppose it would flow east, because of Chisholm creek. Along there I don't recall having learned anything in regard to its east-and-west direction. I have photographs showing it flowing north and south on the north-and-south streets; I have one photograph that shows it close to Douglas avenue and about where the Manhattan hotel is. I don't know that it must have flowed east
6931 in order to get east on Douglas avenue as far as the Manhattan hotel. (Objection.) If I remember rightly, the Little Arkansas river is straight north, because the Little river bends to the west. I don't know that the city of Wichita from one or two blocks west of Main street to three or four blocks east of Main street slopes to the east. I know it slopes to the south. If the difference between the Rock Island depot and the Missouri Pacific depot is as given in that level—if those were adjusted—that would indicate some eastward slope. My impression is that the north-and-south slope is more than that. I have noticed that the surface
6932 drainage in the gutters on Main and Market and Lawrence and Topeka and Emporia, naming them in their succession from the west, all flows to the south and the east.

Cowskin creek rises south of Mount Hope. Its head is a little north of west of Wichita, and in a straight line at right angles from the river it would be eight or ten miles. Yes, it gets nearer the Arkansas river than that. At a point a little southeast of Mount Hope it cuts within four miles of the Arkansas river, and then from that point at the nearest point to the Arkansas river it flows practically parallel with the Arkansas river and empties into that river near Whitman, about eight miles north of Oxford. It is south of Derby, at least. As to how the lands between the Cowskin and the Arkansas river slope, I will say that for nearly all of that distance there is another stream between the Cowskin and the Arkan-
6933 sas river. The general slope seems to be pretty evenly divided between the Big Slough and the Cowskin. Yes, the Big Slough is between the Cowskin and the Arkansas. Its beginning is nearly as far up as that of the Cowskin, but it runs into the river a great deal sooner than the Cowskin does—quite a number of miles sooner. As to whether the land slopes from the Arkansas river to the Big Slough and then from the Big Slough it is practically level over to the Cowskin, I will say it depends on what you mean by "practically level." There is a divide in between the two. There are no hills of any kind, no, sir. There is a parting of the waters there, yes, sir. No, the land does not slope toward the Cowskin on each side of the Big Slough. The land between the Big Slough and the Cowskin slopes both ways—that is, toward the Big Slough

6934 and toward the Cowskin. That between the Big Slough and the Arkansas, of course the water from that land is divided between the main river and the Big Slough, and I should judge from the contour map that the divide would be approximately half way between the two. As to which is higher, the bed of the Cowskin for its whole length or the bed of the Arkansas for a corresponding number of miles above the mouth of the Cowskin, I would say at the northernmost point of Cowskin creek the Cowskin is higher than the Arkansas, as shown by the Cheney sheet. That is the point. No, sir, that is not its source directly; that is down three or four or five miles from the source. As to the comparative elevations of these two rivers or creeks, from the contour lines of the Cheney sheet the Cowskin is nearly 20 feet higher than the main river at that place. Near Colwich the Cowskin would seem to be a little lower than the main river, to the northeast. Now, if you take that at right angles, it is doubtful from the map which is the higher. Yes, the Big Slough is between the Cowskin and the Arkansas along there.

6935 I don't know from personal knowledge where Garfield college is located in Wichita. I have not been over there. I don't know that I have seen it from the city of Wichita. It seems to me it was pointed out to me, but I have no recollection of it. Yes, sir, that is the one that is known as Friend's university, and it seems to be about three blocks south of Douglas avenue and three-quarters of a mile west of the river. I should judge so. As to whether I have learned that at that point the drainage is toward the Big Slough and into the Cowskin rather than into the Arkansas river, I will say, no, sir, I have never heard anything about it. From the contour map the divide, I would suppose, would be a little west of that.

6937 As to when the first flood of 1904 that made any appreciable appearance east of the Kansas-Colorado line came, I will say, there was a rise in January at Coolidge, rising about 700 cubic feet per second. There was a small rise then in February, amounting to 400 feet. A flood at about the same time took place at Arkansas City a few days later, rising to 500 feet. That, then, could not have been the same one. I don't know the origin of this water. There was no flood in March at Coolidge. In May there was a very high flood at Coolidge, from May 2 to May 6. I think that has all been stated in the record, but it was away up. The highest was in the neighborhood of 10,000 cubic feet per second. The next one at Coolidge took place about the 27th. It began to rise on May 21. That ran up to a maximum of in the neighborhood of 12,000 cubic feet. Early in June there were great floods at Kinsley, Great Bend, Wichita and Arkansas City that don't show at all at Coolidge. That at

6938 Arkansas City was about the 2nd, and at the other places from the 2nd to the 5th or 6th. Then at Coolidge there was a small rise on the 7th of June, and a greater rise on the 9th. That ran up to apparently something like 25,000 feet at Coolidge, at the

extreme high waters. Then there was a flood about the 22nd. That is, the river had decreased at Coolidge and there were several rises. There was quite a high rise on the 22nd of June. That was still higher, being in the neighborhood of 30,000 feet, in fact our estimate at the highest water was close to 40,000 feet at Coolidge. That was above the gauging we had made, and therefore the evaluation was one of estimate. Now, in July there were small rises at Coolidge, on the 5th running to 800 feet and over, dropping down on the 6th to less than 600 and rising then on the night of the 6th to 1,100 feet. That dropped down immediately and then jumped to nearly
3,200 feet on the 9th. On July 26th, there was a sudden
6939 spurt, running about 5,000 feet. Yes, there are records of floods at Hutchinson and Wichita during the month of July. At Hutchinson the river was high—well, it started in in the beginning of the month, July 1st, at about 2,600 feet and rose on the night of the 4th,—in fact it was rising on the morning of the 4th,—and remained above that height until the 10th, reaching a maximum of approximately 7,000 feet. That flood at Hutchinson dropped rapidly to the 12th, and then more gradually to the 23rd, when it was between eight and nine hundred feet. There was a heavy flood at Wichita on that date. That might be termed the same flood as at Hutchinson. It is not by any means the same water, because there were contributions in between of large extent. The water was high at Wichita all through that period, rising from the 1st to a summit on the 3rd, decreasing on the morning of the 4th and then rising pretty steadily to the 9th, when it seemed at its maximum, from the single daily observations. I think that flood at Wichita from the 7th to the 9th is the one that is referred to by
numerous witnesses as the flood of 1904. That kept up rela-
6940 tively high until the 15th, when it dropped down to about 4,200 feet, and then it dropped steadily for the rest of the month. That flood must have extended up above Hutchinson, because at Hutchinson the river rose quite rapidly. As to Ellinwood, I don't know. That flood didn't show at Great Bend. There was a rise at Coolidge, as I mentioned, on the 9th of July. That was quite a rapid rise and one of considerable extent, but it doesn't show at Great Bend or Dodge except in a very small rise. That water had disappeared so that the flood at Hutchinson was a different flood entirely.

On August 2 the river was high at Coolidge, rising a little
6941 over 8,000 feet. There was also a rise on the 7th of August, reaching 2,700 feet. Each of these floods lasted for a very short time. There was a rise on the 19th of August, the crest reaching 8,300 feet. Yes, sir, the Eden flood was on August 7, and this flood at Coolidge was not the one that caused the Eden wreck. The one that caused the Eden wreck on August 7, 1904, may have been the cause of the slight rise at Coolidge on the 11th. The river descended on the 10th at Coolidge to less than 100 feet; then it rose on the 11th to nearly 400 feet—between 300 and 400 feet. That

seems a little early for that Eden wreck flood to reach that point, but it couldn't have reached there before that. Yes, sir, the Eden flood flowed into the Fountain and from there into the Arkansas river.

In September there was a rise at Coolidge, on the 4th, of very short duration, which rose to nearly 2,700 feet. That was the only rise at Coolidge except the beginning of a rise on the last day of that month. On the morning of the 30th it rose to 300 feet, and then fell in the afternoon, and rose during the night of the

6942 30th and on October 1st.

There was one flood in October. That was a flood that reached its maximum about the 1st of October, reaching the height of 27,000 feet. As to what flood caused the washing out of the Santa Fe tracks in Colorado and New Mexico, I will say, well, as to New Mexico, they were floods entirely disconnected from the Arkansas river, that is, over this portion. I may add that I am not sure about the floods on the Cimarron, which is a tributary, but excluding that, of which I know nothing, the floods at Trinidad about this date—I think September 30 or October 1—I am not at present sure of that date—it was essentially the same flood as this October 1st flood. That came from a general downfall of water that was very heavy through a large section of that country. Yes, sir, that flood overflowed the Santa Fe tracks at Trinidad and washed out certain portions. No, there were no other floods in October, nor were there any in December.

6943 As to my having made or having had made any measurements of any wells in Sedgwick or Reno county prior to August, 1904, I will say no, sir, I think not. Yes, sir, the measurements on August 27 and other dates near that were for the purpose of ascertaining the water levels of those wells at those dates. Yes, sir, all of those measurements made near the farms of Messrs. Harrison, Rutledge, Breese, Huss, Jorgensen, Hansen and the two Shives were measurements made after the 1st of August, 1904. Yes, sir, I stated in my testimony that we found the water level there higher than they had testified to it in their direct examinations. No, sir, they had not testified as to the condition of the water level on the dates on which we took those measurements. They testified I think in some cases as to the dates when they testified. Sometimes they were prior to dates. As to whether any of them pretended to

6944 to give the water level at the particular date of their testimony, my recollection is that several did; that they said the level of the water is so deep now; and as to whether the word "now" was to be understood as meaning the date of their testimony, I will say I don't know whether I could put the entire connotation of that term as they used it, but I took it as representing the depth at that general time. As to whether I meant in my testimony to contradict theirs on that point or whether the date that they had set for a lower water level was prior, perhaps even months or years before, I would say, oh, it might have been. As to whether I meant

that I understood their testimony to indicate that at the particular dates on which I measured the wells they had found them four or five feet lower (objection), I will say no, I understood in most cases they were testifying from their general belief and not from measurements. As to the dates they were testifying to being months or even years prior to that, I couldn't say as to that. The depths
6945 which I testified to were the depths at specific dates, most of them or all of them, and at dates subsequently to their testimony, so that they did not state the depths on the dates that I measured the wells. (Objection.) In some cases I thought they meant that the water was then—at the date on which they testified—at the depths which they mentioned. Thus, Mr. Harrison, I think, said the water is "now" a certain depth from the surface. I suppose he based that on his general belief, covering, it may be, some
6946 time. That I don't know. I will say in regard to Mr. Harrison's testimony that he did state afterward, I believe, that he didn't know the exact level on that day. As to my having stated that when I went north on those two lines, one at Colwich and the other at Mount Hope, the level of the underflow rose, and then when we went east it fell from that point, I will say the ground water was higher as we went north and was lower in general as we went east. As to what point in the river that water would leave the river to reach a particular well, I will say I don't know as it would leave the river at all to reach a particular well; in fact my conclusion was that the water in the well didn't come from the river. As to the fact as to whether it came from the river or not, I don't know. As to what particular point in the river a rise would affect the level of the water in a well, I will say I can't answer that question, because it is not definite, so that I would not want to give a definite answer. As to whether it would be a point up the river from the well or a point exactly at right angles from the well or a point down the river from the well, I will say, water cannot flow up hill. Therefore, if the surface of the ground water rises from the river to the well, that would show conclusively that the well could not be supplied from the lower river. You can in every case go far enough up
6947 stream to find a point higher than a well, but it does not follow at all that the water will have come from a higher point up there.

As to whether I found a change in the water level at the well near Mr. Hansen's farm, I will say, well No. 4 at the northwest corner of Bentley and at the northeast corner of Mr. Hansen's place, from August 27 to March 13, showed no particular change. From August 27 to September 20 there was a descent—that is, a lowering—of the water amounting to a little more than six inches; then on October 4 and 6 it was higher, from this graphic diagram. It was so small that it could hardly be measured—perhaps an inch or two inches. On the 14th of October, by that time it has lost what it had risen, and then a very slow descent took place, so that by December

12 it was about eight inches lower than it was on August 27; then from there to the latter part of February it lost another six or eight inches, and then slightly rose on March 13th. That well is a little more than three miles straight north of the bridge on that section line—from the river. The river runs southeasterly, and at the nearest point is about two and three-quarters miles from the well, according to the map. The general slope of the land at Bentley

6948 is toward the main river, that is, the slope is south, and, I presume, southeasterly. As to a flood on the surface at Bentley finding its way into the Big river or the Little river, I think it is quite likely that that would flow east of south into the Little river. From the topographical sheet of Wichita and Cheney it is not clear, but it looks probable that that would be the case. As to the measurements and observations of the level of the water under the uplands along the Arkansas river varying as much in height as the level of water beneath the bottom lands, I will say, speaking of the extreme changes, I am inclined to think that the wells on the uplands will show as great a rise as those on the bottoms, because there is a limit to the depth to which the water will sink in the bottoms. In our observations during these few months we have found a rise in some of the upland wells that has been very nearly as large as any in the bottoms. That is, speaking generally, though that is confined to a very small percentage of the wells, and the changes ordinarily take place slowly.

As to what causes the rise of the water in a well on the up-

6949 land, I will say, it is the precipitation—the rainfall—entirely, so far as I know. To make that more complete, if the well is on a summit or divide where the water falls both ways, it is the immediate rainfall entirely; if the well is down a slope the height of its water will also be in consequence of the water that drains to it from the slope above, so that it is the rainfall at a second degree removed.

As to the rainfall in western Kansas as shown by the records having increased or decreased or remained practically stationary, I will say I wouldn't feel that I have examined those records enough to give a definite answer to that question; that is, that the rainfall has increased or decreased. There is reason to think there is a periodicity in the rainfall. Taking a series of years, as at Wichita or Dodge City, the rainfall often shows a number of years that are above the average and a number of years below the average, and without feeling that it is safe to draw a general conclusion, it may be said that at Wichita the past three years have been above the normal.

6950 Of the three prior years, one was below the normal and the two others above the normal, and for the four years before that one was above the normal and then three below the normal. Yes, sir, I heard the testimony of the weather observer at Garden City introduced by the of Colorado some two weeks ago. I have not had the records at Garden City except as I heard them at that time. They have not been compiled in such form as we have them at Dodge City and elsewhere. No, sir, the records that he used are

not a part of the same records that I use. I get mine in the reports of the Kansas weather service. I have made no general comparison of them. Several Kansas students of weather have spoken of the periodicity of the rainfall in Kansas. I mean by that that
6951 for a period of a number of years we would have the average for that series of years above normal, then for a series of years the rainfall would fall short of the normal. Thus, Chancellor Snow of the University of Kansas and Mr. E. C. Murphy, formerly of the University of Kansas and now of the Geological Survey, have so stated in printed reports in both cases, I think, considering that there was a period of about seven years. As to whether the rainfall for a number of years last past on the eastern slope of Colorado has increased or decreased or has been about normal, I will say, I am not prepared to say from anything that I have at hand, and of the data which I do have coming to me directly I have not made a comparison. I did notice that Pueblo fell off last year materially. I have a record at Cheyenne Wells for twelve or fourteen years, but haven't compared the last few years with the earlier ones. I don't know.

The picture of the Fort Lyon dam, Defendant Colorado's Exhibit 30, that was introduced in evidence yesterday, was taken on July 6, 1903. That was a flood period. Yes, sir, I stated in my tes-
6952 timony yesterday that it would take about six days for a flood to go from Coolidge to Arkansas City. That is approximately correct. Yes, sir, or, putting it in another form, that flood would go about fifty miles a day—not far from that. The May flood took eight days to go from Coolidge to Arkankas City, or, more accurately, seven and one-half days.

In my testimony yesterday concerning the crops through the Arkansas valley, and as to whether I also found from those same records that sometimes the crops are poor when the total precipitation is as high as in other years when the crops are good, I will say I compared the extreme years without comparing the intermediate ones. But as to your question, I don't know, because I didn't compare except for the extreme years. As to whether the crop
6953 depends more upon the seasonableness of the rainfall than upon the exact amount of the precipitation, I will say it depends very much on both. I spoke of the effectiveness of the rainfall, and by that I meant largely its distribution; that is, a small amount of rain distributed at the immediate times is more effective than a larger amount of rain at other times. But there are one or two of those cases where the total was fairly good but in single months it was exceedingly small. If there had been no rainfall for the last sixty days when the corn is maturing, as to whether it is almost impossible to have a good corn crop, I think that is shown in the figures that were given, and that might be although the total precipitation for that year might be high. But in that higher year it is noticed that the distribution is fairly uniform between the months. The daily distribution I didn't examine.

6954 As to my stating yesterday that the State of Colorado at the present time was not carrying on any irrigation or using the water directly in the Arkansas water shed for the purposes of irrigation, I will say I think the question was not quite that. The State of Colorado has no ditches. The State of Colorado has built three reservoirs, but those were used to equ-lize the flow, and the State has no irrigation that I know of. As to my predicting what the State of Colorado may do in the future, I will say, I am not predicting as to its action, no, sir. As to whether there was any well defined level of the ground water in Colorado prior to the establishment of the ditches, and that there was not any such in the State of Kansas in the valley of the Arkansas, if I understand that question I will say yes, sir, so far as our information goes. In eastern Colorado, the country being so arid, there has been very little occasion to put down wells outside of an irrigated area. There have been some. Where they strike gravel over an impervious
6955 stratum they have found water there as they have in Kansas. These wells were few in number. The settlers or ranchers were few and consequently there has been no particular thought or attention to the sheet water, which has been noticed with the increased number of wells in Kansas. Much of the conditions, though, speaking physically, of the ground, are the same. Yes, sir, I think it has always been true that within the valley of the Arkansas river in Kansas upon the first or second bottoms by digging down a few feet you could always strike water. As to whether that exact condition extended through the State of Colorado in the immediate vicinity of the Arkansas river before any irrigation ditches were established there, I would say I have no positive knowledge. I should think, however, from the conditions, that it must have existed. As to the first bottom lands in Kansas and the western portion of Kansas extending right along up the river with their same characteristics as far as Pueblo or Cañon City, I will say in a portion of Colorado the bottom lands, I think, are of a more adobe character. Some of them are at least. But they are underlaid with gravel, and when they would get down into the gravel they
6956 would strike water just the same. No, you don't always strike water in Kansas in the first bottom lands within ten or twelve feet. As to my knowing of any first bottom lands from the State line of Colorado to the State line of Oklahoma in which you will not strike water in twelve feet, I will say I only know from what the State geologist of Kansas says. He speaks in his report as State geologist of a lenticular area near Garden City where there is clay and where the water is not struck until they get through that. I can refer to that if you desire. My own investigations have not covered all the bottom lands of Kansas. Yes, so far as my time and means would permit I have been persistent during the last six or nine months in gathering information. In those areas just spoken of we have found the water in nearly every case—there have been one or two
5957 wells not far from the river where water was not found. In

one case in particular it was through or in a layer of clay, and water was not found in that clay at the time of sinking the well. Now, while the investigations or my direct measurements have not been such as to cover the whole ground, yet I think they have revealed the general conditions, and wherever we have an impervious clay you have got to get through that into water bearing strata, whether on the upland or low land. In general you do not have very many of those cases, but I know of no reason why you will not have them at times, and where you do you will not get water until you puncture that, and then very frequently the water rises. I think in other places the water was found at a relatively moderate distance.

Yes, sir, I quoted in my testimony one paragraph of a report by J. D. McKown, found in Executive Documents, third session, Forty-fifth Congress, 1878–9, volume 16, and at your request I will read the whole of that report, with the exception of pages 10 and 11, including the last paragraph on page 11, introducing the whole of the report on pages 8 and 9 and the first two lines on page 10 and the last paragraph on page 11, as follows:

6958 Report of Mr. J. D. M'Kown, Assistant Engineer.

United States Engineer Office,

St. Louis, Mo., January 27, 1879.

Major:

I herewith respectfully submit the following report of the examination of the Arkansas river from the mouth of the Little Arkansas river to Fort Smith.

In accordance with orders received from this office, I proceeded to Wichita, Kans., and commenced the examination of the river at the mouth of the Little Arkansas.

The latter stream empties into the main river a short distance above Wichita; part of the water is diverted from the natural channel to supply a mill, but again comes into the main river some 2½ miles below the city. The Arkansas river is very tortuous in its course, that portion from Wichita to Arkansas City passing through a prairie country, and has very little timber on the banks, a thin growth of cottonwood and willows prevailing.

The bed of the stream is very wide for the amount of water running, and is of a light sandy nature, quicksand prevailing in large degree. In many places where the current is strong there is a thin layer of gravel over the sand, which once broken through shows the soft sand underneath.

As we go down the river rock becomes somewhat frequent, rock ridges often crossing the stream, sometimes almost amounting to rapids, and leaving but little room for the passage of boats at low water.

I had the advantage of seeing the river at a very low stage of water and in its worst condition. At no time during the examination was there a rise of more than 6 inches, and that lasted but a few days.

The distance from Wichita to Fort Smith I estimate at 409 miles, divided as follows:

	Miles.
From Wichita to Arkansas City	65
From Arkansas City to the State line	14
From State line to Grand River	236
From Grand River to Fort Smith	94
Total	409

The small amount of money available rendered rapid work necessary, and a hurried reconnoissance was all that could be made.

On such information as I could obtain, I respectfully submit
6959 the following approximate estimate of the cost of improving the river for steamboat navigation at low-water.

The Little Arkansas river empties into the Arkansas about ¾ of a mile above the bridge at Wichita. The bed of the main stream is from 600 to 800 feet wide from there to the bridge. The slope of the river from the mouth of the Little Arkansas to a point one mile below is 3.03 feet; high water mark at Wichita from the best information obtainable is 7.45 feet above low-water. The bridge at Wichita has the lower chord 10 feet above low-water, but as the landing would probably be below it, it need not be taken into consideration.

From Wichita to El Paso, a distance of some 15 miles, the slope of the river is about 3 feet per mile, or 45 feet for the whole distance. The bed of the river is generally wide, and to within 2 miles of El Paso needs a continuous series of dykes and dams to contract it to a proper width, which would be about 150 feet. This would take a dyke of 600 feet every half mile for 13 miles, or 7,800 feet in all. About 2 miles above El Paso the river narrows down to about the required width, with not less than three feet of water in the channel. This extends for nearly 2 miles.

About ½ mile above El Paso there is a rocky reef extending across the river, running out from the left where there is a rocky bank. The expense would be but slight to place it in good boating order—$2,500 would be sufficient.

From El Paso to Oxford the distance is 25 miles. The difference of level between the two places is about 69 feet, giving a slope of 2.75 feet per mile. This piece of river is a continuous series of comparatively short bends, and the water being forced on the convex side of them, forms a good channel in most places. It will require about 78,000 feet of dam for this distance, or 312 feet per mile.

About 1½ miles above Oxford there is a brush and rock dam which is built for the purpose of throwing in a race or ditch, where

it is used for mill power. The dam is a slight, irregular-built affair, angling down stream.

The difference of level of the water above and below it at the left bank is 1.37 feet. The right bank here is about 40 feet high and of talcose slate.

At Oxford there is a ponton bridge. A roadway built to it is made of rock, brush, and prairie hay, the latter predominating, and seems to make an excellent dike, closing the river in to about 150 feet, and making a good channel along the bluff for about a half mile.

Some four miles above Oxford the Ne-Ne Scah creek empties in to the river, adding someting to the volume of water.

Brush for mattresses is quite scarce on the river from Wichita to this place, but there is but little doubt that the tall, rank
6959½ prairie grass, which is indigenous to this region, and grows in great abundance, could be used to advantage in the work by mixing it with the brush, and in all probability would be economical.

About ¾ of a mile below Oxford the river widens out and is full of bars. At five miles from Oxford the banks on the right are high and contain considerable loose slate. The river bottom is of rock, but there is a fair depth of water—from 2½ to 6 feet. About 14 miles above Arkansas City, the banks on the left are about 30 feet high, of sand and clay, underlaid with loose rock.

The slope of the river from Oxford to Arkansas City, a distance of 25 miles, is 65 feet, or 2.6 feet per mile. The approximate amount of water in the river at Arkansas City is 675 cubic feet per second. At this place there is a wagon bridge about 600 feet in length, with the lower chord 20 feet above low-water. A draw would be necessary to allow the passage of boats. In the present state it is an obstruction to navigation.

* * * * * * *

That portion of the country tributary to the river in Kansas, from Wichita to the State line, is rich, fertile and well cultivated, and would derive great benefit from the opening of the river to navigation. But where so much of the river passes through an almost uncultivated country, it is questionable whether the expenses of the improvement would be justifiable.

Respectfully, your obedient servant,

J. D. McKOWN,
Assistant Engineer.

Maj. Charles R. Suter, Corps of Engineers, U. S. A.

Redirect examination.

By Mr. DAWSON:

6960 As to whether or not I have any way of accounting for the rise in the well sunk near the place of Mr. Hansen of which

I testified as varying from two to eight inches, or for accounting for rises of any greater extent than that in general, I will say, well, rises of that amount or even more are very frequently due to rainfall, in fact a good heavy rain may cause a change of the ground water of a good deal more than that. Yes, sir, that would be especially true if the well were sunk in low ground where it would not only get the effect of rain directly but the effect of rain draining from the higher country or of rain draining down, except that the rise due to the water draining down would be longer delayed, but it would then keep it up for a longer period. Yes, sir, rises like two or three inches are caused by other than an excess of water. For instance, a change in the pressure of the barometer has been found to cause a material effect on the ground water, and also a change in the temperature has been found to have a very clear effect on the water, but that is not so great in amount. As to the
6961 amount that might be due to an extreme change in barometer, I would say there must be a change of as much as an inch due to a change in barometer as shown by the graphic records reported in one of the Weather Bureau bulletins.

As to what I can say as to some of the peculiarities of the country lying east of Hutchinson along the Arkansas river, I will say as you get down the Arkansas valley to Hutchinson and thence to Wichita there is a marked flattening out of the valley on the north or east side, and that extends northeasterly up into the vicinity of McPherson in McPherson county. That condition has been so marked that it has been the subject of monographs on some of its general physical features, asin the geological survey of Kansas, and the monograph there in the second volume of the Kansas geological survey under the title of "The McPherson Equus" by the State geologist, Prof. Hayworth, with an assistant, Mr. Beede, showing a uniform physical condition, a region in which the slope is very small, a region where the sand beds are not far down and where water has been quite uniformly distributed. There is also apparent a marked channel cut down into the underlying rocks, so that in fact it has been suggested that the Smoky Hill river, which is now to the north, has at some time in the past flowed down through that region
6962 and cut that valley and has been the cause of this formation by the subsequent filling in of recent deposits. It cuts down below or across sand stones which are generally or always spoken of in that section as the Dakota sand stone and which are the water-producing beds, wherever cut across, and furnish springs, as at the head of Sawlog creek and Buckner creek and Pawnee creek, etc.

As to what effect, if any, this condition or these peculiarities of the surroundings there might have upon the lands as to keeping them well supplied with ground water, I will say, it gives those conditions which have been shown in that section, of water within a moderate distance, and as the country is so nearly flat and porous it gives the condition for a large absorption of the rainfall and a condition of country favorable to good agriculture and good crops.

That same region covers the region north of Colwich, Mount Hope, Bentley and Halstead, all of which are in that area.

As to that place that I referred to where the change in barometer affected the level of the water to the extent of one inch, I will say that has been reported from definite comparative measurements at Madison, Wisconsin. That has been the only place I know of where I know series of records have been made in order to put those two changes so as to compare them. It has been known
6963 for many years that the flow of the water in drains increased or decreased with the barometer, but a comparison such as was made by Professor King has not been made before. Professor Hayworth, of whom I spoke, is professor of geology, or head of that department, in the University of Kansas at Lawrence. He is also State geologist of Kansas. As to having given considerable attention to the geological formation in Kansas and to conditions of water and having written upon these subjects, I will say that he has been the chief of the geological survey, and a few years since when Kansas formed, by act of the legislature, a board of irrigation survey and experiment, he was one of that commission, I think, designated as an advisory member by the statute, and made quite an elaborate report in the report of that commission on the ground water of Kansas, stating the geology of the underground water. As to whether he anywhere gives what might be termed a definition of underground water or underflow, I will say that he
6964 does. On page 79 of that report, more particularly designated the Report of the Kansas Board of Irrigation Survey and Experiment, 1895–6, to the Legislature of Kansas, published at Topeka in 1897 (objection), I will read as follows:

"The term 'sheet water' is now about as widely used as 'underflow,' and practically means the same thing, so that in common usage the two terms are synonymous. The latter term expresses within itself the popular idea of the great lateral extent of the water and says nothing about its amount, while the former expresses the popular notion of movement and says nothing of the lateral extent. The 'underflow' or 'sheet water' is therefore the water so often referred to in the preceding pages, and corresponds with similar masses of water found in all humid parts of the world wherever we have in combination the two conditions, a loose, porous surface mantle of considerable thickness and a firm, impervious flood beneath, provided of course the floor is not so greatly inclined that the water will flow away as fast as it accumulates."

Cross-examination.

By Mr. CAMPBELL:

In regard to how much lower the Little Arkansas river is than the Big Arkansas river in the vicinity of Wichita, well, at its mouth of course it must be higher because it flows into the Big Arkansas river. Now, at the places above that I do not have definite levels

so that I can put that in feet very closely. The topographical maps would show that in a number of places it seems to be lower than the main river opposite. I think it is several feet lower above its mouth.

6965 No, I do not attribute the shortening of the rainfall in Colorado and New Mexico along the Rio Grande to the cutting off of the timber. I have never been able to see that the forests in the mountains could materially affect the precipitation. I have testified, though, that the forests did affect the preservation of the snow, and otherwise, but I have seen no direct effects that would lead me to a definite conclusion that it changed the rainfall.

Q. Now, state what area a foot deep the normal flow of the Arkansas river at Cañon City would cover during the growing season, say May, June and July, taking the average of 750 feet for the whole year.

A. If the flow be taken as 750 cubic feet per second, that would cover 135,000 acres one foot deep for those three months.

6966 Well, taking the months of May, June and July, it is certainly true that the average flow at both those places is higher than the yearly average assumed. It certainly would be at Cañon City, and in all probability it would be at Coolidge.

Recross-examination.

By Mr. ASHBAUGH:

I spoke of the Report of the Kansas Board of Irrigation Survey and Experiment for the years 1895 and 1896 and read a selection from it. I will now read the last paragraph on page 186 of the same work at your request:

"The Arkansas and Cimarron rivers would furnish a less amount of water than any of the others; a very large portion of the former's water is taken out in Colorado, and this will be increased in the future, it may be to the entire amount at the State line, except the large floods."

6967 I presume that he had been referring to the Republican, the Solomon, Saline, Smoky Hill and Medicine rivers in the previous paragraphs. I have not noticed that.

I do not personally know a man by the name of D. M. Frost. Yes, sir, he has an article in this same work, beginning on page 187, and at your request I will read the paragraph at the bottom of that page:

"Since 1892, the surface flow of the Arkansas river has gradually failed, until in the year 1896 there was scarcely any flow east of the Colorado line; not because there was any diminution in the water supply at the sources of the river, but on account of the increase in the number and carrying capacity of these ditches constructed in Colorado, which absorbed all the waters and thereby left Kansas ditches unsupplied. There can, perhaps, be no serious objection to this, since Congress accorded to the State of Colorado that right when she was admitted into the sisterhood of States, but it leaves our ditch

owners and farmers in a very precarious condition on this side of the Colorado line."

Redirect examination.

By Mr. DAWSON:

I think Mr. D. M. Frost was a member of this board of irrigation survey; that he was president of it, appointed by the governor. He lives at Garden City.

6968 Mr. DAWSON: In the examination of the witness Louis G. Carpenter he was inquired of as to the level of the water found in many wells sunk in the State of Kansas and as to the measurements of the distance between the surface of the land and the point at which the water was found, and as to the level of the water in these wells as compared with the level of the water in the Arkansas river. The witness testified that these measurements were made by persons in his employ and under his direction and that reports were made to him directly. If counsel for Kansas will concede that if these persons were called as witnesses they would testify that the measurements which they made were correctly made and were truly reported to Professor Carpenter, then the State of Colorado is willing to conclude; otherwise we wish to call said witnesses.

Mr. ASHBAUGH: Counsel for Kansas concedes that if the parties employed by Professor Carpenter to make these measurements and reports were present and testified in the case they would testify that they made such measurments and correctly reported the same to Professor Carpenter; but we reserve the right to controvert such facts so reported and the conclusions drawn from the same by the witness who has just testified.

Defendant Colorado here rested its case-.

Complainant's Testimony in Rebuttal.

GARDEN CITY, KANSAS, May 31, 1905.

6970 A. H. BURTIS, Garden City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live at Garden City, Kansas, and have lived here for twenty-five years, and am special agent of the General Land Office of the United States Government. I have held that position about

6971 seven years. Yes, sir, I am acquainted with the lands in Hamilton, Kearny, Finney, Gray, and Ford counties, Kansas, and my business has taken me through these counties many times, and I have been acquainted with the Arkansas river for twenty-five years. I came to Garden City on March 17, 1881.

Yes, sir, I am very well acquainted with Mr. Frost who lived at Garden City. He was chairman of the board of irrigation survey

and experiment. I was a member of the house of representatives of the Kansas legislature in 1897, as a representative from Finney county. Yes, sir, the board of irrigation survey and experiment made a report to the Kansas legislature for the years 1895
6972 and 1896, and on page 187 of that report there is an article prepared by Mr. D. M. Frost, from which I read the last paragraph:

"There are in the State at this time about twelve hundred miles of irrigating canals or ditches, all of which have been constructed since 1880, at one time or another, irrigating upwards of 200,000 acres of land. 800 miles of these irrigating canals are located in the counties of Hamilton, Kearny, Finney, Gray and Ford, along the Arkansas river, from which they derive their water whenever water flows in that river. These ditches have been the means of bringing under a high state of cultivation and productiveness one hundred and twenty-four thousand acres in the five counties named."

I presume the time he refers to is the year 1896. The Arkansas valley on an average through Finney county I should say was about two miles wide, varying in width.

Yes, sir, I have heard of the underflow in this section, and as to what determines the height of the underflow or its level, I will answer, the amount of water in the river. As to how far back the underflow extends from the river, I should say at least to the uplands, and a good deal farther. Yes, sir, the level of the underflow back to the uplands is shown in the cellars and wells and
6973 pools at and near Garden City. (Objection.) If one witness for the State of Colorado has testified that the influence of the river upon the underflow does not extend back more than 500 or 1,000 feet (objection), I should say he was a total ignoramus concerning the actual conditions of the underflow. Yes, sir, I was here when the ditches through Kearny, Hamilton, Finney and Ford counties were dug or established. I should say that those ditches were used for practical irrigation purposes up to about 1888 or 1890, somewhere along there, and after that they were to a certain
6974 extent abandoned for lack of water. I have known of the fact that Colorado, from about the year 1887 to about the year 1893 appropriated a great amount of water from the Arkansas river in Colorado for irrigation purposes. The appropriation of water in Colorado and the use of that water for irrigation purposes have not tended to equalize the flow of the Arkansas river, and to furnish more water in the river during the dry season. As to how the average flow of the Arkansas river for the last ten years, exclusive of flood seasons, compared with the average flow during the same season of the years for the first ten years I knew it, I would say there has been practically no flow during the last ten years during the seasons that water naturally comes from the
6975 mountains. (Objection.) As to whether the Arkansas river for at least 200 miles east of the Colorado State line is as

wide as it was when I first knew it, I will say I hardly think it is, The channel has filled up with sandbars and islands within the last ten or fifteen years a great deal, sir, yes, sir. As to the cause of that, I think largely drifting sand and no water to carry it off.

Cross-examination.

By Mr. MILLER:

I have lived here twenty-five years next month. As to any personal knowledge of the mileage of the ditches constructed mentioned in the report by Mr. Frost, I will say, not that I actually surveyed, nor by actual survey have I any knowledge as to the acreage that was actually watered from those ditches, no sir. Those ditches were constructed some in about 1880, 1881, 1882 and 1883,
I should say, somewhere along there. I helped to build
6976 three of them. No, sir I would not attempt to designate
how many miles were built in any one year or what acreage was watered during any particular year. As to whether water was already appropriated in Colorado at that time, I would say, not very much if any. No, sir, I am not aware that this record shows the decrees that have been entered and the dates of appropriation. I am not aware of anything that is entered in these records.

As to my statement that the underground water is dependent upon the water flowing in the stream, that as the one goes up the other rises and as it subsides so the underground water lowers, I will say that I have made tests upon which to base that statement. In the spring of 1882 I dug a cellar under what is now Lawrence's coal office. At the time I dug it the river was pretty low, and afterward there was a freshet came down and I had about a foot of water in the cellar, and that is where it came from. As to my statement that the water was low in the river, I will say it was hardly flowing, just a little stream on one side. One of the channels had some water in it. As to the volume of water that is flowing in the river
today, I will say there is quite a little bit of water in the
6977 river. As to how much higher the water is in the river to-
day than it was at the time I refer to, I will say I haven't been down to the river for a few days, but a good deal higher. I couldn't say in inches. As to its being a matter of fact that the water in the Arkansas river does not rise but a very few inches at a time except when there is a large overflow or flood of water coming down, I will say we used to have a good current of water running pretty nearly all the time. I expect the depth of water when the flood season is on is from 6 to 8 feet, but I don't say there is from 6 to 8 feet in the river today, no, sir. Yes, sir, I would say there are 3 feet in the river today if it has not subsided in the last three days.
I have not been down there for several days. Three feet of
6978 water is very much above the normal flow in the river dur-
ing the wet season. As to whether this underground water that I speak of rises proportionately, I would say it certainly does.

As to having made any experiments since 1882 to demonstrate that statement, I would say I have had some knowledge by reason of another cellar that I dug where I live now. That was in 1899; also in a well or alleged well my little boy was digging in the back yard to amuse himself. As to the conditions I found in the cellar in 1899 that showed me that the water came from the river instead of the surrounding country, I will say, my judgment in the matter is based upon the fact that the cellar is dry when the river is comparatively low and is very damp, if it don't have water in it, when the river is away up, and there is no chance for the water to get in from any other source unless it backs in from the underflow.

Cross-examination.

By Mr. CAMPBELL:

As to whether all this underflow comes from the river, I will say that I have no doubt that the sand bed—that the water percolates as the water in the river shoves it back, and it rises in the sand. As to whether if there is no water in the river we will have any water in the underflow, I will say we would certainly have water
6979 after we get down low enough. We would have to dig farther for the water. As to how far, I will say, as I recollect, in dry times we would have to go down eight or ten feet. I couldn't tell you, I am sure, whether if they continue to take all of the water out of the river in Colorado eventually the underflow will entirely disappear. There might be a little of this underflow that comes from other sources. No, sir, it would not be a mere matter of folly on the part of the Government to put in a plant here at an expense of $250,000 to utilize this underflow, if they go deep enough for water.

Q. Well, if it comes from the river, will it not all be exhausted in time, if you do not have some in the river?

A. I take it for granted that it will rain more.

No doubt a small quantity of the underflow comes from rainfall. I don't say it all comes from the river. A large part of it comes from the river, and part from the rainfall. It comes from
6980 both sources, no doubt. I couldn't make any proportionate estimate of the amount that comes from the river and the amount that comes from rainfall. Yes, I have qualified as an expert in this case.

6981 W. McD. ROWAN, Garden City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I am county clerk of Finney county at the present time, and I have the assessor's rolls, yes, sir. Yes, sir, I am fairly well acquainted with the bottom lands of Finney county that are under the irrigating ditches in Finney county and that could be supplied

and irrigated from those ditches. Yes, sir, I would be able to give the locations of particular pieces of land in connection with those ditches. Yes, sir, I have a list of lands located under those ditches. This list I made myself as county clerk and the lands are located in the west and northwest part of the county, all under the irrigating ditches in this county; that is, under the Amazon and Great
6982 Eastern. Yes, sir, I selected the quarter sections and have given the valuations for the years 1889, 1897 and 1903 as valued for taxation. Yes, sir, these are the correct assessments of those particular pieces of land as shown by the records of my office known as the assessor's rolls and the taxes as extended by the county clerk at that time on the tax roll. No, sir, these do not represent all the lands under the Amazon and Great Eastern ditches; they are merely selected at random. I just took the tax roll, and knowing where the land is located, I just picked here and there a quarter section. The ones that are selected show uniformly the reduction in valuation. No, sir, there are not other lands under this ditch that would show a rise in value. The description of
6983 the land and the assessed valuation for each of the years as I put them down on this paper and the taxes collected are as follows:

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Description.		Val.	Year.	Tax.	Val.	Year.	Tax.	Val.	Year.	Tax.
N. W.-4	23-22-34	450.00	1889	$13.67	250.00	1897	8.15	190.00	1903	7.79
N. E.-4	" " "	450.00	"	16.15	250.00	"	8.15	190.00	"	7.79
S. W.	" " "	450.00	"	13 67	250.00	"	8.15	190.00	"	7.79
S. E.	" " "	450.00	"	16.15	250.00	"	8.15	190.00	"	7.79
N. W.	25-22-34	450.00	"	16.15	240.00	"	7.94	165.00	"	8.41
N. E.	" " "	450 00	"	16.15	240.00	"	7.94	165.00	"	8.41
S. W.	" " "	450.00	"	16.15	280.00	"	9.26	215.00	"	10.96
S. E.	" " "	450.00	"	16.15	240.00	"	7.94	165.00	"	8.41
N. E.	8-23-24	500.00	"	8.45	240.00	"	7.34	150.00	"	6.74
N. E.	10-23-34	600.00	"	10.14	300.00	"	8.28	175.00	"	7.87
N. E.	12-23-34	500.00	"	17.95	300.00	"	9.93	150 00	"	6.74
N. W.-4	23-23-34	600.00	"	10.74	260.00	"	8.98	175.00	"	6.47
N. E.	" " "	600.00	"	21.54	260.00	"	9.38	175.00	"	6.47
S. W.	" " "	600.00	"	10.74	260.00		8.98	175.00		6.47
S. E.	" " "	600.00	"	21.54	260.00		9.38	175.00		6.47

(Objection.)

No, sir, this list does not show all the lands under these ditches. I took them at random, knowing the location of the land
6985 and the ditches, from the records in my office, just simply picking the quarters here and there, one of them, which is the Scott & Marsh ranch, particularly, which is in section 23. No, these are not all of the lands that show a like decrease in assessed valuation and taxation. Yes, sir, it is a fair example of the taxable valuations. I certainly think so. It was my intention to make it that way. So far as my information goes, as to what was the cause of the decreased valuation and decreased taxes collected from these lands as shown by this list (objection), I will say it is due to the fact

that the alfalfa, the principal crop that was at one time raised on that land, had been largely destroyed, and in a good many cases entirely so, from lack of ditch water. I know that not only from my duties as county clerk but from actually seeing that land—one section that I spoke of particularly.

I have lived in this county continually since 1890. No, I
6986 don't own any land in the county, but I am acquainted with the lands through the county. As to whether I am acquainted with the fact that in the Amity ditch there was water at one time which was brought across the State line from Colorado into Kansas and irrigated certain Kansas lands, I would say, from hearsay only. I took it as a fact from the way I got it, not that the lands were irrigated but that the water was run across the State line from the Amity canal into Kansas.

Yes, sir, I have been in Colorado, and I got that information from a merchant or a gentleman with whom I did business at that time in Holly, Colorado. As to the purported reason why the water was not longer carried across the State line from Colorado into Kansas for the purpose of irrigating the land under the lower end of the Amity canal (objection), I would say it is certainly true that it is hearsay, but I was told by a gentleman who is now dead, Mr. S. F. White of Holly, Colorado. In discussing the matter it seems that Mr.
6987 Wiley or some of the patrons of the Amity canal on the east end of it in Prowers county were not getting as much water as they wanted and they raised trouble with Mr. Wiley because they shut off the headgates. I don't know that it is a fact that during the last few years no water has been brought across the State line in the Amity canal to irrigate lands in Kansas, no, sir.

Cross-examination.

By Mr. HAYT:

Yes, the lands in the list I have read are lands from under the Great Eastern or Amazon ditch. The Great Eastern ditch is moderately long. It is twenty or twenty-five miles, possibly, from the lands I speak of there that it touches. Seventy-five miles may be its total length, but not where it reaches that land. It is
6988 forty or possibly forty-five—its total length. No, sir, I don't know that it is not over forty or forty-five miles in length, and I don't know exactly the size of the ditch. Of course in the last year or so I am not so well acquainted with it because it has passed into other hands and has been enlarged, and just what it is now I couldn't say. No, sir, I could not give an idea of the approximate amount of the lands under that ditch. Up to the land that it reaches here it skirts considerable low land on the bottoms, where it does not cover a great deal of land, until its gets up about the edge of this county. It runs quite a ways before it irrigates very much land. Yes, sir, it covers many thousands of acres, and it was built to irrigate many thousands of acres, and at one time it did ir-

rigate a good many thousands of acres. I couldn't say how wide it is at its intake. I don't know as I was ever there. But at the widest point where I visited it the ditch was about 12 feet on the
6989 bottom. That is about twelve miles from where it comes out of the river.

As to how large a ditch the Amazon is, I have crossed it on the railroad and have been at its headgate a good many times, but I wouldn't want to say positively. It is a pretty good size ditch.

I don't think the Great Eastern is wider than what is now known as the Farmers' ditch. I wouldn't say positively since the enlargement of that what the sizes are. The Great Eastern, yes, sir, is being operated by different parties; that is, it is owned by somebody else now, I think largely by Colorado capitalists. I don't know that it was purchased by Senator Swink and others. I don't know Senator Swink. Possibly it may have been. I have understood it was Colorado people who purchased it. Some Kansas people were interested with them, but it was Colorado capital largely. No, sir, I don't know the reason they bought that ditch. I think they
6990 do own some lands under it. I have understood that they cleaned this ditch out since they purchased it, but have never seen it since they bought it. As to whether this ditch prior to the time they purchased it, had any dam to turn the water into the ditch from the river, I would say they have been using water some years when they could get it. I don't know as to whether such dams as they would use were simply sand dams and washed out. I was not at their headgates. The Amazon ditch I am better acquainted with, because I know something about it, using the water under it at one time. No, sir, I don't know as a matter of fact that it is not the custom in western Kansas to put permanent dams in the river for the purpose of turning water into these ditches. You take the head of the Amazon ditch, for instance, their dam is what you would call a permanent one. I don't know about the Great Eastern. The Amazon dam is built with cribs, not masonry. Right where the Amazon comes out it is shallow to the rock, and they would drill in it with iron pipe and fasten the cribs with that.

6991 Yes, sir, I aimed to make this statement a fair example of the lands under this ditch so far as the decrease in value is concerned. As to whether the lands in this county under ditch have generally depreciated in value in the last two or three or four years, I would answer, I didn't say in the last two or three or four years and didn't so make it in that statement. In the last two or three or four years they have increased in value under the two ditches I mentioned there, yes, sir. I don't know what they are worth now. I am not in the land business and don't know. And I don't know what they were worth before. I simply take the decreased valuation from the assessor's returns. That is what I am here to tell you, and not what I know myself. No, sir, I know nothing about it of my own knowledge. As to whether I know as a matter of fact that

tands are higher in this county at the present time than they have been back in 1885 or 1886, I would answer, they may have gotten so in the last few months, yes, sir. As to whether I know as a matter of fact that a great deal of money has been made here recently by the increased value in farm lands in this county, I will say the increased value of outlying lands, not what we call our farm lands. As to what we call farming lands in this county our experience has proven that unless you can put water on it it is mighty poor farming land. Yes, sir, our experience has shown that
6992 irrigation is necessary ordinarily to the growing of general crops in Finney county, and that only a few crops can be grown on these uplands, and they are not of very much value and the crop is not very reliable. Yes, sir, so far as the question of irrigation is concerned, I, in common with the people of Finney county, am in favor of using the waters of the Arkansas river for irrigation purposes; but as to the general sentiment and general wish of the people of this county, I can only speak for myself. Yes, sir, I have talked with others a great deal in regard to this matter, having held an official position in this county for some time, and this is true so far as I know. If the objects and purposes of this suit are to require the people to keep the water in the Arkansas river and not take it out for irrigation, as to whether this suit would meet with the approval generally of the people of this county, I
6993 would say (objection), why, no, sir, of course it wouldn't, if that was the purpose of the suit. Such a doctrine would be absolutely destructive of the best material interests of Finney county and the country west of the 100th meridian. (Objection.) Why, certainly.

As to why I did not include in this list the value of these lands for the year 1904, I can say that I could just as well have done so as not. There was no particular reason and no particular change in the valuations, sir. No, sir, counsel did not request me to give the valuations for any particular years. I just simply picked them out at random. I could have taken the whole thing if I had time or cared to have done so. As to what proportion the assessed valuation of lands in Finney county bears to the actual valuation of the lands, that is a hard question for me to answer. All personal property is based upon one-third of its actual valuation, and exclusive of
6994 improvements, there is an effort made to get at one-third of the actual valuation of the raw lands without improvements. That is the intention. But then of course you know those things are not always done that way. That is the intention of the board of equalization. Yes, sir, the assessor's rolls would show the assessed valuation of all the lands in Finney county for these years covered by this sheet I have read from, and I could furnish that, but I could not furnish it from memory. No, sir, I could not give it approximately at this time. I would have to get the records. As to the general proposition that the valuation in the aggregate has increased or diminished in the last ten years for farming and other lands in this

county, I could state that it has decreased, both the farming and the outlying lands, yes, sir. As to whether this statement was introduced in evidence for the purpose of showing that there was a decrease in the valuation of lands in this county, I would answer, I don't know what it was for. Counsel for Kansas asked me to make it, and I did it to the best of my ability. Yes, sir, I know well
6995 enough that it does show there has been a decrease in the assessment in this county, because there has been. As to whether I know just as well that there has been an increase in the actual market value of these lands during the last four or five years in this county, I would answer, there might have been a slight increase, possibly, but there has been no change in the assessed valuation which I was asked to make in that statement; and as to my opinion with reference to the actual value of the lands in this county and whether the same has not increased during the last five or six years, I would say, no, sir. In the very late part of the last five or six years it has increased, yes, sir. Yes, sir, these farming lands are higher now than they were five years ago, but they are very little higher than they were twelve years ago. It has all been done in the last twelve months, is what I want to get at. Yes, and that is true of these outlying lands. It is the general effect all over the county. No, sir, I don't think these outlying lands have more than doubled in salable value in the last two or three years. No.
6996 sir, I don't think they have doubled in the last year, and as to whether I know of sales in this county to have been made at double the amount asked for those lands a year ago, I would say, there possibly may have been. I have heard of such sales, but they are something that I have paid very little attention to. It has been out of my line of business. As to the fact that lands in this county are as high now as they ever have been in the history of the county outside of the period of boom years, that may possibly be true. I think it is true, yes, sir, I believe it to be true.

I couldn't say as to there having been a great improvement in the Great Eastern ditch since the change in ownership. I understand there has been. They have enlarged it or cleaned it out. Yes, sir, prior to that time it had fallen into disuse to some extent. It was owned by non-residents, who didn't put up money enough to keep the ditch in repair. I rather think that is true, yes, sir; and I think it is true that after the panic
6997 of 1893 it gradually fell into disuse until the Colorado parties took possession of it, yes, sir. Yes, it is true also of these other ditches as a rule. They have been reorganized and new parties have taken them over. I don't know that that is true of the Amazon, but I rather think it is. It is true of the Farmers' ditch, yes, sir. As to its being true of the Garden City ditch, I will answer, I rather think that in recent years that has been purchased by the farmers living under the Garden City ditch, yes, sir. As to whether since these new parties have taken hold of these ditches and improved them there has been a great

impetus to the sale of land and of town property in Garden City, I would answer that I don't know as there has, sir. Possibly town property in Garden City has advanced some in the last year or two, yes, sir, and it may be it is held a great deal higher than it was a year or two ago, but I don't know that that results from the hope and expectation of the development of the country by reason of the improvement of these ditches. As to this being my opinion that it is based largely upon that, I would answer, it is what the buyers have back of their wanting to buy. As to what in my judgment has
6998 given the people of the country increased confidence in Finney County properties, I don't know that I could say just what their increased confidence is based upon. I have an opinion, yes, sir. My opinion is that our lands are cheaper than they have been east of us and people are coming in here looking for them. Whether they are looking for irrigated land or not, I could't say. As to whether this town has anything back of it to support it except agricultural interests, I would say, agriculture, cattle, sheep, etc. The town largely relies upon the stock interests of the county, and chiefly upon the stock interests of the county and of the surrounding community. It has heretofore; what it may be in the future I don't know. No, sir, I do not know that the hope and the future of this part of the county comes from the agricultural interests developed by systematized irrigation. I don't know it. Yes, sir, we have had some sugar beet lands around here, and some of our people are trying to raise sugar beets without irrigation. I don't know whether they will succeed in doing it. No, sir, I have never known them to succeed in raising them without irrigation. I have
6999 never known them to try it until this year. Yes, sir, such sugar beets as have been raised here heretofore have been raised by irrigation. No, sir, I don't know of any reason why sugar beet land here should not be as valuable as sugar beet land in Colorado. I don't know of any reason for it if you can get water to irrigate. Yes, sir, they pay the same price for the sugar beets, less freight, which is a minimum, and with the Holly factory there will probaby be no freight paid from this point. It will be just the same as they will get there. The contract for the sugar beets reads in this way—that the factory pays the freight up to 50 cents a ton, but of course we don't know what the railroad companies are going to charge. It ought to be in proportion to the rate we are paying to Rocky Ford. 50 cents ought to cover it. As to whether our sugar beet land here, with sufficient water to irrigate it, ought to be worth $100 or $200 an acre, I would say it ought to be worth as much as for raising that crop anywhere, I think. No, sir, I don't know what that land is worth about Rocky Ford. Their prices up there
7000 are pretty high. Yes, sir, I have been up there a great many times, and I understand the sugar beet land is selling at fancy prices there, I understand as high as $300 and $400 an acre in small tracts. That is from hearsay. No, sir, I can't see any reason why the lands of Finney county under a proper system of irri-

gation should not be worth just as much as lands at Rocky Ford. Yes, sir, we are nearer the eastern markets, but are no nearer the sugar beet market, and we are at a lower elevation, yes, sir.

No, sir, I don't know that a good deal of the town property in this city has been changing hands recently. Yes, sir, I know that the opera house has been sold. No, sir, I don't know that the building opposite the opera house has been sold. In my position as county clerk I would transfer the deed, and I haven't seen any deed to that effect. The comparative sales or comparative transfers are
7001 so small you would hardly notice them, sir. As to this boom, if there is a boom, being largely with the real estate men, I would answer it is largely with the land and not in city property, as I understand your question.

As to what I mean by alfalfa lands, I don't remember mentioning alfalfa lands. I spoke of alfalfa that at one time grew on the flats under our ditches. What we term alfalfa land is that land in this county that will produce alfalfa without irrigation. That is the common interpretation of alfalfa lands.

As to what crops can be raised here with irrigation, I would answer, I think we can raise most anything we try to that is adapted to this climate. The crops best adapted to this climate and vicinity with irrigation are alfalfa and small grain, I would think. Fruits grow very well. Roots and vegetables grow all right. As to cantaloupes, they have never been tried on very extensive scale. We raise very good ones here in a small way. Yes, sir, irriga-
7002 tion in this vicinity tends to the diversification and extension of the kinds of crops that would be raised. That is true.

The population as returned by the assessors in 1904 for 1903 shows a very small increase. This year it has not yet been tabulated. Yes, sir, I know as a matter of fact that there are some people coming in this year, and it may be that the trains are better loaded with immigrants for Garden City and Finney county this year than for a good many years. I didn't pay any attention to it particularly. Yes, sir, I have observed a good many strangers on the streets and at the hotels, but whether they are settlers or just coming in and out, I couldn't say. I know some new comers have settled in the county in the last year or so. I think the county generally is increasing in population, sir, and I think the county has a good future before it, yes, sir, and I hope we have passed through our dark times and that prosperity is now knocking at our door.

Redirect examination.

By Mr. ASHBAUGH:

7003 Yes, sir, as to the increased price of land I spoke of, that was mostly confined to our uplands in this county, and almost exclusively. That is my judgment and observation. That increase has been very recent, within a few months only has it been appreciable—I will say since the first of January, 1905.

Yes, sir, it is true that in certain places in the early years alfalfa was raised under the ditches where it has not been raised in later years. As to why those ditches did not irrigate in the later years as they did in the earlier years (objection), I would answer, it is lack of water, sir, I think, in the river to fill the ditches or to get
7004 the water to the lands that I speak of. As to whether there has been more water in the river in the last thirteen months than for a number of years prior to that time, I would say so, yes, sir. As to how the average flow of the river, exclusive of floods, prior to May, 1904, for five years, compares with the first year or two that I knew the average flow of the river (objection), I will answer, well, the first years I was out here I paid but very little attention to the river. I would say that the flow for the last few years has been considerably less than it was when I came out here in the '90's; and as to the appropriotion of water in Colorado for irrigation having tended to increase the flow of the river at the dry season of the year, I would say not, sir.

Mr. HAYT: On behalf of the defendant, The State of Colorado, we object to the complainant in rebuttal introducing any evidence upon the following points:

1. As to the amount of water flowing in the river at any time prior to the commencement of the taking of the evidence in this case in August, 1904;
2. As to the general water level of the country;
3. As to the depreciation of land values;
4. As to the alleged underflow;
5. As to the decrease of the flow in the river;
6. As to the lowering of the water level in wells;
7. To all other evidence that may be offered that is not strictly in rebuttal of the evidence heretofore offered by the defendants herein, or offered on behalf of some one or more of the defendants.

We object to the introduction of such evidence for the reason that its introduction is in violation of a fundamental rule of practice, by which rule it was imperative for the party upon whom the burden of proof rests in this case, to-wit, the complainant, to produce in chief all the proof it desired to offer in support of the allegations in its bill, and it ought not to be allowed in rebuttal to introduce any proof except that which directly rebuts the proof offered on the part of the defendants or offered on the part of some one or more of them. In its testimony in chief it introduced more than sixty witnesses upon these points, and it ought not to be allowed at this time to reopen its case in chief.

I wish these objections to be taken and considered in reference to all this evidence offered in rebuttal, and make them at this time and in this way so as not to encumber the record, and to avoid repetition; and we wish the objections to apply to the evidence

not only of this witness but of all of the witnesses offered in rebuttal.

(Witness continuing:) Well, the first few years I was out here I paid very little attention to the river, and I would say that the flow for the last few years has been considerably less than it was when I first came here in the early '90's. I would say that since the appropriation of water for irrigation in Colorado such appropriation and use has not tended to increase the flow of the river at the dry season of the year.

Recross-examination.

By Mr. HAYT:

7006 No, sir, I have never made any investigations of return or seepage water from these ditches.

Yes, sir, I travelled up and down this country as far west as Rocky Ford for a good many years. No, sir, I never have had occasion to make investigations as to return or seepage water.

As to whether I am in favor of the use of the water in the river for irrigation according to priorities, I would answer, I don't think the question of priorities has ever been asked me before, but

7007 I am in favor of the use of the water in the river for irrigation. As to the question of priority or other rights, I have never studied into it or paid any attention to it particularly; and when I say I am in favor of the use of the water in the river for irrigation I mean I am in favor of the use of all of the water if it can be applied beneficially to the soil to the growing of crops, yes, sir.

As to whether I said these ditches were not used for a number of years after I came here and gave as my reason that I thought that was because there was not sufficient water in the river, I would answer, I don't think I made the statement that they were not used. I said the lack of sufficient water put them practically in disuse as far as the land which I was asked about here—or the lands in our county—to reduce the taxation. Yes, sir, when I stated that the lands were in practical disuse I meant that the water was not to be had in the ditches for the irrigation of those lands. That is what I aimed to say. As to whether I know that during many of those years there was water in the river at different times, I would answer, an occasional flood, yes, sir, lasting a few days, and in some years those floods might have been numerous, in several or two or three of them, possibly, and in other years there was only one and it was gone in a short time. Yes, sir, there were two or three of

7008 them at different years with varying duration. Some lasted longer than others.

As to how many irrigations I think it requires here with our rainfall to raise alfalfa, I think two good irrigations a year would be all right. It would keep up life anyhow.

As to whether there were any local reasons last year (1904), for instance the visitation of grasshoppers, as to why values were

disturbed in this vicinity, I would answer, in the assessing of last year I don't think there was any attention paid to it. That is, in the equalization. I don't have any recollection of it. Yes, I recollect very distinctly we had a visitation of grasshoppers last year, and some of these fields were entirely denuded of grass for the time being, yes, sir, and that might have had some effect toward the depreciation of values for that year. It might possibly have had, but I don't think—it didn't help it any. But I don't think it was taken into consideration, for the reason that the assessing of lands by the assessors was done before the grasshoppers came, and the equalization was done before the grasshoppers did their damage. As to the actual value of the land independ-
7009 ently of the assessment, why, it hurt it, there is no question about it. The assessor of this county lives in this community and naturally would sympathize with these people in their loss from the grasshoppers, certainly, but as to whether he would make it up as well as he could by decreasing the assessment, I would answer, I have been trying to tell counsel that—that the assessing commences in this county on the 1st day of March and ends on the 10th. The books are supposed to be in my hand by May 10th, and the grasshoppers had done no damage up to that time. The grasshoppers came in the latter part of May and early part of June—in the latter part of May just after the books had been in my possession. No, sir, these schedules were not made up after that time to any extent, either by the county commissioners or by the
7010 board of equalization. The board of equalization met on the 6th day of June last year, and a great big part of the damage done in this country was after that. Well, possibly some was done before. I think I have a recollection of two pieces of property last year that were reduced in value by affidavit on the part of the party that a part of his alfalfa had been killed by grasshoppers. Two pieces, I think, and two only.

Yes, sir, I said that the average flow of this river had been less during the later years than in the early '90's. I think so. As to how much water there was running in the river in the year 1890, I would answer, why, I came here in the middle of the year 1890, in June, and I know that in the years immediately following that three or possibly four years, the Great Eastern, Amazon and our own ditches here in this county were running water a good part of the irrigating season, and in after years commenced to drop off and they didn't get the water. As to whether there was water running in these ditches in 1890, 1891, 1892 and 1893, I would answer, I am simply judging from memory. I think so. I wouldn't say positively, because I didn't make any memorandum of it. I wouldn't say how it was in
7011 1894. I don't remember. As to whether I think the panic had anything to do with the run of water in the ditches, I would answer, I think not, and as to how I judge of the average flow during those years from what I saw in the ditches, I would

answer, from what I saw in travelling up and down the river—from the observation of the river itself. I really couldn't say how much water the river had in it at any point where I may have crossed it during that summer, that is, during the summer commencing in 1890. I never had any cause to measure it and my time belonged to someone else. It was in merely travelling up and down here. It was merely casual observation. No, sir, I didn't make any observation to determine whether the water was likely to diminish in the future or not. As to whether I know as a matter of fact
7012 that during those years, 1891, 1892, 1893 and 1894, there were always times when the river was practically dry at Garden City, I presume there were. I wouldn't say positively, because I don't remember. I have seen it a great many times when there was no water in it. I don't remember those years in particular. I never noticed it particularly until I became a little interested, in about 1896 and 1897. Yes, sir, there has been more water in the last year in the river than the average. There has been a great deal more. As to whether there has been more water in the river during the last year than during any other year I have been here, I would answer, I rather think there has been, yes, sir, that would be my guess at it.

Redirect examination.

By Mr. ASHBAUGH:

If the surplus water of the Arkansas river and its tributaries should be impounded in reservoirs in the State of Colorado, or in the State of Kansas if such reservoir sites could be found,
7013 and if such waters were then used during the irrigating season to supply the ditches in Kansas, as to what effect that would have upon the lands in Hamilton, Kearny, Finney and Ford counties that are under ditch, I will answer, I should think it would have a very beneficial effect, for it would insure a permanent supply of water and in sufficient quantity to irrigate during the irrigating seasons.

(Complainant's Exhibit A–53 offered in evidence. Objection.)

7014 E. P. BARBER, Garden City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live at Syracuse, Kansas, and that is the county seat of Hamilton county. I have lived there ever since March, 1873. I am a newspaper man now and stockman. I have been principally in the stock business, and have done some farming, and I own land of my own, about a quarter of a mile from the Arkansas river and right on its banks.

Yes, sir, I have been acquainted with the Arkansas river since 1873, and have lived almost right on its banks. Yes, sir, I
7015 have lived where I could observe the river from my house most of the time during these thirty-three years.

Yes, sir, I know something about the underflow. I think I do. As to how far back from the river this underflow extends (objection), my observation is that that underflow goes back to the natural bluffs, through Hamilton county, and the natural bluffs would average a mile and a half back from the river. At Syracuse the bluffs are about three-quarters of a mile on the north and probably a quarter of a mile on the south. The observations that I have made and on which I base that statement were my observations in our natural hay bottoms, as we call them—wild hay bottoms—and they have been decreasing from year to year, especially the last
7016 four or five years. We don't get nearly the amount of hay we used to, on account of the river, and there not being any sub-irrigation to make it, and that in some of our best bottoms we had natural ponds caused by the rise of the river that kept water in them the year round. Now they are all dry. These natural ponds that were supplied from the river have been dry between three and four years, and they had been decreasing probably about a year before that. Probably about four years ago you might say we first observed the decrease in them. As to whether the level of the underflow is determined by the amount of water in the river, I will answer, it certainly is, and as to what leads me to that conclusion, I will say, well, you take it in our wells, for instance, the well at my house is three-quarters of a mile from the river and the water rises and lowers in that from two to three feet. When the river is down dry comparatively there is no water in sight at all. We have to use a drive point to get any water. And when the river rises the well is up full again. As to whether that occurs constantly, I will answer, it does in the rise and fall of the river. As to whether
7017 the water in my well rises and falls according to the amount of water in the river regardless of whether there has been any rain on the uplands or not, I will say the rains on the uplands don't seem to have any effect on it. As to where that water comes from that affects the water level in my well, I will say it comes from the river.

As to how the average flow of the river, exclusive of flood seasons, for the ten years prior to 1904, compared with the average flow for the first ten years I knew it (objection), I will say it has been decreasing. I couldn't say just how much it has shrunk away, but it is a good deal, so that it has affected our bottom lands very much. It has nearly ruined our natural meadows. We hardly get enough now to pay for cutting. We used to get as high as two and I have cut three tons per acre. Yes, sir, I have cut hay myself on these original bottom lands.

7018 As to whether I know of other wells in Syracuse that have been affected by the condition of the river outside of my own,

I will say, most all of them. I hear complaints of my neighbors up and down the river that they are affected in the same way.

In the fall of 1903 the river was very low. As to how long that condition lasted, I will say, after the rainy season is over we generally get no rise in the river to speak of up until cold weather sets in, and this low condition in the fall of 1903 lasted until the next spring—the next flood—which I think was in May, 1904. I will not be sure. As to how the flow of the river during the last thirteen months has compared with the flow during half a dozen of the previous years, I would say there seems to be a little more water. There is considerable water in it at the present time.

7019 Yes, sir, I know of their taking some water in Colorado for the purposes of irrigation up there. As to what effect the taking of water for irrigation in Colorado has had upon the flow of the river through Hamilton county during the dry season of the year (objection), I will answer, it has taken nearly all of it. Our ditches have not been able to get any water, scarcely. They got a little water last year, but the year before that they got nothing. During the ten years prior to 1904 as long as the ditches were running they had sufficient water, as a general thing. There were short periods in that time the river would be down, but the natural flow of it was fair. As to whether the taking of water for irrigation in Colorado has tended to increase the amount of water in the Arkansas river in Hamilton county during the dry season of the year, I will

7020 answer, it certainly has not. As to whether it has tended to equalize the flow of the Arkansas river through Hamilton county, I will answer, I don't think it has. I am pretty sure about that.

I think there are four or five ditches in Hamilton county. There is the Alamo and the two Ford ditches and the Pratt ditch and the Coolidge ditch, and I won't be sure whether that is all or not. The Pratt ditch is what used to be called the Collier ditch. These ditches had water in them for some time after they were built, yes, sir. They have not had a sufficient supply of water during the dry or irrigating season of the year for five, eight or ten years prior to 1904, no, sir. I can't give the dimensions of those ditches accurately. I could get somewhere near it. The Collier ditch was maybe twenty feet wide on the bottom when it was first built, and probably it would carry on an average of two or three feet of water in

7021 depth. I don't know just exactly what the grade of the ditches is. It is a regular grade that they all use on ditches. I should think about 2½ to 3 feet to the mile. The Alamo ditch is smaller; it was probably 12 feet or more when it was first built. It will carry about 12 feet of water, and on an average of three feet of water in depth, and the same grade as the other. The Alameda ditch is about the same grade as the Alamo. They got washed out a year ago and they haven't replaced it. The Ford ditch was built about the same, on the south side, about 12 feet, about the same grade, and the one on the north side was not quite as large, proba-

bly 8 or 10 feet, and then the Frontier ditch, I don't know just the size, but I should judge from crossing it it is about the same size—
about 12 feet wide and 3 feet deep. I think the Collier ditch,
7022 if I remember right, was built in 1882 or 1883, and I think they turned the water in that spring. The Alamo ditch I think was built about a year afterward. That would be in the year 1883 or 1884. I wouldn't be positive just the date. And the water was turned in immediately after it was constructed. The next one was built a year or two after that, which would be in 1884 or 1885, and the water was turned in immediately after it was built. (Objection.) The Frontier ditch was built about three or four years ago, maybe. That is just a recent ditch, yes, sir.

Cross-examination.

By Mr. HAYT:

7023 Yes, sir, I located in Hamilton county in 1873, and I engaged in the cattle business in a small way in Syracuse. Yes sir, I lived at Syracuse at that time, right upon the Arkansas river, and I have always been in the cattle business from that time to this. Yes, sir, I have done some farming in addition to the cattle business. I intend to raise crops enough to feed my cattle. As to how extensively I have been engaged in the cattle business, I would answer, I have small herds running from 50 to 200 head. They pasture upon the public range in the summer, yes, sir, and I feed them in the winter. Yes, sir, principally I look after the man-
7024 agement of the cattle myself, and my farming has been confined to the growing of what is commonly called "roughness" for the feeding of cattle. No, sir, I have not done any farming in the way of growing wheat or oats or anything of that kind. I have not followed any other business besides the cattle business and the newspaper business. I first engaged in the newspaper business in 1900. No, sir, I haven't followed that up to the present time. I sold out a year ago last April. I commenced again on the 8th of July last year. My paper is the "Syracuse News." Syracuse when I settled there in 1873—well, I was going to say there was nobody there. I was the first settler, yes, sir. I put in the first colony in Hamilton county, on the 23rd day of March, 1873. Yes, sir, I was interested in the location of that colony. I was what they
7025 term the father of it. I was the promoter of the enterprise. The principal portion of the colonists then came from Syracuse, New York. In that year I put in 80 families. We never had any more come to that colony, virtually. That ended it. But the settlement has been gradually increasing. Oh, yes. They come and go. At the present time I think Syracuse is between 1,200 and 1,300. It depends for its support upon the cattle business and farming, and principally upon the cattle business. The people seem to be thrifty and prosperous at the present time, yes, sir.

As to there having been some improvement in real estate values

of late in Hamilton county as well as in Finney and other counties along the river, I would answer, well, I hardly think that myself, although some of my neighbors think there is. Yes, sir, in
7026 the line of speculation there has been more demand for real estate last year than in previous years, but I can't say that values have improved either for speculative or other purposes. The sales are principally made on the uplands—low priced lands, for speculation. No, those uplands are not sold at much higher prices than they were held at a few years ago. I have sold lands up on those flats for $8 or $10 an acre. That was when the boom was on. I can't tell just the year now. I guess it was along about 1886, about the time of the boom at Garden City and all the way through. Yes, sir, at the time those lands were sold for $8 or $10 an acre the principal inducement leading the people to buy them at that time was because they thought there was sufficient rain for the growing of crops; and as to what my experience has shown in the way of rainfall being sufficient to success-
7027 fully grow crops ordinarily in my county, I would say, well, I wouldn't advise a man to do it. There are men that do do it, but I say I wouldn't advise a man to do it, because there are very few men that know how to do it, and the men who do it are very few and the best of them make failures at times, certainly.

As to how much land is under cultivation in our county at the present time, I would answer, I couldn't tell you. I don't know. There is a good deal if it, from the ditches.

Yes, I remember pretty well the amount of water in the river in 1873 when I came there. No, sir, the river did not go dry that year, nor in the fall of the year. Yes, sir, there is something else that causes me to remember the year 1873 particularly. I was riding for the different cattle men that year through the summer and fall and winter, keeping cattle at the bog holes. That is what I did
7028 principally. Yes, sir, I guess we had grasshoppers that year—1873 and 1874. Yes, I recollect that the grasshopper year was a dry year in western Kansas. I will tell you why I know—because I was cutting hay when the grasshoppers came, and we had to cross the river—we had no bridges—and the water would come into the wagon box every day as we crossed. That was in September. No, sir, the river did not go dry in October, and in fact all that year there was some running water in it. As to when the river first did go dry, I will answer, I must say to you that I never saw the Arkansas river dry at Syracuse. There has always been some running water in it, yes, sir.

No, sir, those irrigating ditches did not go out of practical use in 1894. I said in 1893 we had but very little use from them.
7029 Yes, after 1893 they remained out of use for some time to a great extent. One of them is out now.

No, sir, there was no water in the river during a portion of those years from 1893 up to 1900 that might have been used in the ditches, only in occasional floods. Yes, sir, an effort was made in flood times

to use the water for irrigation. It was used in flood times—used by those that wanted it or needed it. I don't know anything about the Great Eastern—whether it runs through my county or not. I don't know anything about the Amazon. As to there being permanent dams to turn the water into these ditches, I would say not in Hamilton county. The people used the water whenever they could get it for irrigation. Yes, sir, on the bottom lands it is absolutely necessary to the growing of crops in that county that they shall
7030 be irrigated. As to the elevated lands, they don't need so much water, because it is different soil. It is lighter soil and don't require as much water as the bottom lands. Yes, sir, I suppose we can raise better crops on the uplands with irrigation than without it. I never tried it. I don't know it to be a fact from having observed it in the county or in western Kansas, no, sir. I never saw any irrigation on the uplands. No, sir, there is no irrigation in our county on the second bottoms, and I am not posted in regard to other counties than ours.

Yes, sir, I have had practical experience in raising some crops besides hay. I have raised cane and kaffir corn. No, sir, these are not crops raised without irrigation, not on the bottom lands. We raise them with irrigation. Certainly it is greatly to the benefit of the people of Hamilton county that the waters of the Arkansas river be used for irrigation purposes. As to what extent I would apply the waters for irrigation, that is, whether I would use it to the extent of using all the waters in the river at a given time if necessary to irrigate the lands under ditch, I would say I would if there were lands enough under cultivation to use it.

7031 No, sir, I don't think we have had just as much water in the last year or year and a half, 1904 and so much of 1905 as usual. Yes, we have had a pretty fair river for the last year and a half, but not what it used to be by any means. As to how the water is in the river at the present time, I couldn't say how much is running, because I haven't been to it. I see it every morning when I get up. I can stand in the house and see it, but I couldn't tell you how deep it is. It is pretty wide. You can't tell exactly from the sandbars, and the water may be very shallow, and then in other places it may be very deep and very narrow. You can't tell without going to it. No, sir, I have never made any investigations, myself, of late years to determine how the water was running in
7032 the river. I have never figured on it. Yes, sir, during the earlier years I used to watch it pretty closely before we had any bridges. We crossed it more or less, sometimes to our sorrow. As to later years, no, there is not as much water now as there used to be. Oh, no, I have not observed it carefully in crossing the river. I have not been to it every day. As to it being a matter of public interest to me and to my county and a matter of interest to myself as a citizen and as a newspaper man to know how much water is running in the river, I would say there is no money in it for me, for that matter. I haven't time to go down to the river to see what

is running in it. I might rather see it in the ditches than in the river.

7033 As to the ditches at the present time, I would answer, the men claim they can't get any water. That is, they don't at the present time, but that has been the claim they put up when we would ask for water, that they couldn't get any because there was none to get. At the present time you can get water, yes, sir, and I presume that has been true for the last month or two. I couldn't say, really. Yes, sir, I see the river from my house every day, and there has been a good deal of water coming down, for the last month at least. Yes, sir, last year we had a good many freshets and there were a good many times when there were large bodies of water coming down the river, and it might have been used for irrigation if the parties had turned it into their ditches, yes, sir. When the river is up they can use it.

No, sir, there has been nothing done toward re-seeding these bottom lands I speak of as hay lands during these years. They have been mowed each year, yes, sir. No, sir, not as a general thing

7033½ were cattle turned upon them after mowing, until along in the winter when they commenced feeding them. Yes, sir, at some time during the year the cattle have been turned upon the lands at times. No, sir, not for the purpose of grazing. They are only turned in to feed. They don't intend to keep their cattle on their meadows for grazing purposes. No, sir, not since I have lived there have I allowed my cattle to graze at times on those meadows, because I don't think that is good policy. The kind of grass growing upon these meadows is wild grass—blue-stem as we call it—Kansas blue-stem. Well, there are other wild grasses in them. I couldn't tell you the names.

Yes, sir, it is my theory that the ground water is supplied from the river on the first bottom lands, and as to the rains in any measure supplying the ground water of the country, I would answer, not but a very little. They run into these draws and pass into

7034 the river in a short time. As to whether I have ever had occasion to make any investigation or to know whether this water was flowing out from the river or flowing from the uplands toward the river, I would answer, it would naturally be going toward the river, because there is a bluff on each side. The waters are flowing toward the river, yes, sir. As to whether this ground water in the valley comes from the uplands or from the river, I will say it does not come from the hills above. I am pretty positive

7035 of that. No part of it. Yes, sir, I have made experiments to determine that question. I have been connected with low land meadows for a number of years and know that we get no water from the up-hills. Yes, sir, I have dug a well myself, or have seen them dug, upon the uplands. As to whether I know as a rule that as we get upon the lands higher than the river the level of this ground water is higher, I would say, no, sir, I don't know it. I don't think that is a fact. I don't think any man on the face of God's earth

can demonstrate it, either. No, sir, I have never seen it. I have never run any levels to determine this water level under the higher lands—whether it was higher than the water in the river—no, sir.

7036 The bottom lands at Syracuse are very narrow, probably a mile and a half, maybe a little over. As to how far back the drainage comes in toward the river, I will say there is none; it is right on the edge of the sand hills. As to how far back on each side of the river the ground slopes toward the river so that the drainage in case of rains or severe storms would be to the river, I would answer, that water that comes from rains only reaches the river through these draws. If the ground is level it don't get to the river. As to the water shed that flows toward the river either through draws or in any other way so that in case of rains the water follows the drainage, I would answer, on the south side it is very narrow. It probably runs from a quarter of a mile to two miles; and on the north side it is farther—probably in some places six or seven miles and in some places only two or three miles.

7037 The waters of the next divide flow into what we call Sand creek and the different creeks there, and these streams all enter into the Arkansas, yes, sir. No, sir, the drainage is not very wide at that particular spot when you take these different streams into consideration. They might come out of a bluff right at the bank of the river; but as to the general drainage of the country that comes into the Arkansas river either directly or through other streams that are tributary to the Arkansas, it is very wide, yes, sir.

As to what I understand by the words "equalizing the flow of the river" asked me in the question by counsel for Kansas, I would say I understand that there is less water, yes, sir. As to whether irrigation in Colorado tends to equalize the flow of the river in seasons of drouth, I would say that it does not equalize it. It

7038 leaves it less water. I mean that when the Colorado people take the water all out of the river up there by their dams we get nothing. That is what I mean. As to what I mean by the term "equalizing the flow," I will say I don't understand what you mean by it, and I didn't understand it in the question asked by counsel for Kansas. As to whether or not the irrigation in Colorado tends to equalize the flow of the river in Kansas, I don't think it does equalize it. It shuts it off, that is all, And if that is the question and what you want answered, I can answer it in my way—that it don't equalize it and don't give us the water. No, sir, I

7039 don't know that parties who have had experience and have been successful irrigators in Colorado have recently bought some of the ditches in western Kansas. Not to my knowledge. No, sir, I don't know who the owners of the Great Eastern ditch are at the present time. As to whether I have heard that Senator Swink and others at Rocky Ford had purchased the Great Eastern ditch, I would say, not that I know of. No, sir, I have never made any study or investigation as to the effect of taking out large bodies of

water in flood time and storing such water in reservoirs and spreading it upon the ground—as to the effect upon the seepage from such irrigation and such reservoirs.

Redirect examination.

By Mr. ASHBAUGH:

As to whether the flood season has been as long during the last ten years as it was during the first ten or fifteen years that I knew the river, I would say, no, sir, I don't think it lasts as long. No, sir, the taking of water in Colorado for irrigation purposes—as to whether it has a tendency to decrease the amount of water at high water and increase the amount of water at dry seasons of the year, I will say, no, sir, it has decreased the water in the dry season.

Recross-examination.

By Mr. HAYT:

7040 I hardly think the floods last year were as long as usual. Last year might have been a fair average of the floods of previous years. The river has not been up for a month or six weeks last past, continually. It has been up and down. Oh, yes, there has been water running all the time, and several sharp rises in the river.

7041 ALBERT PRATT, Garden City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I reside five miles west of Syracuse, in Hamilton county, Kansas, and have lived there since 1885, and am farming and cattle growing. My land is on the Arkansas river. I have about 600 acres right in that body of land there, and have a little other land. Yes, sir, I have bottom land in Hamilton county. I have two tracts of land east of where I live, one in section 1 and one in section 3. I live on section 5, north of the river, and have owned that land since 1884, and have practically lived there continually since that
7042 time. My house is from half to three-quarters of a mile from the river, and it is perhaps half a mile from my house to the uplands on the north. Yes, sir, I live on the north side of the river, on the first bottom lands. I don't own any other land excepting first bottom lands. It is about five feet to water-bearing sand right where I live. Yes, sir, I think the level of the water beneath my lands depends upon the amount of water in the river. I think when the river is high the water is nearer the surface than when the river has been low for a time. (Objection.) I should say that the amount of water in the river has an influence upon the underflow back as

far as the bluffs, and that would vary from a quarter of a
7043 mile to two miles on an average west of Syracuse. Yes, sir, it is my judgment that the river affects the underflow back two miles, if the bluffs are that far back. Yes, sir, I am pretty generally acquainted with the bottom lands throughout the country. The hay crop during the ten years prior to the year 1904 as compared with what it was the first years after I went there has not been nearly so good. As to why not, that is a matter somewhat of conjecture, but my opinion is that it is because of the decreased amount of water in the river. That is the conclusion at which I have arrived, based upon my observations as a farmer for twenty years. As to the average flow of the river outside of flood seasons for the ten years prior to 1904 as compared with the flow of the river for the first ten years I was there, I will say, there has not been nearly so much water in the river in the last ten years, except last year. There was a pretty good flow of water last year. I think it came up in May,
7044 1904. There has been a decidedly better flow since May, 1904, and down to the present time than for a number of years prior to that. These same conditions exist on the south side of the river back to the bluffs as I have described on the north side of the river, yes, sir. The bottom lands are wider on the north side of the river along there. I don't think the taking of the water for irrigation purposes in Colorado during the last ten or twelve years has increased the flow of the river during the dry season of the year. (Objection.) I don't think that the taking of water for irrigation purposes in Colorado tends to equalize the flow, making it less during the flood season and more during the dry season, for the last ten years.

7045 Yes, sir, there are irrigating ditches near my place. I am interested in the Alamo ditch that runs through my place. The first ditch taken out of the river in Kansas in Hamilton county was called the Frontier ditch. I don't know. It may have been taken out six or eight or ten years ago. I mean by that that that is the first ditch that comes out of the river in Hamilton county below the Colorado line. The first ditch dug in the county is what is known as the Collier ditch, which was dug in 1882, near my place and runs through it, and my lands are under that ditch. As to how long the water in that ditch was sufficient for irrigating purposes during the dry or irrigating seasons of the year, I will
7046 say, we used the water for four years, from 1884 to 1889, and then I sold out or donated the right of way to the ditch company that built the Alamo ditch—moved the headgate some three or four miles farther west; and then they turned the Collier ditch into the Alamo ditch. In other words, a part of the Alamo ditch is a continuation of the old Collier ditch. They put the headgate up the river farther, I suppose to get a greater amount of land and get a better place to take out the water. As to how long there was a sufficient amount of water in the river during the dry seasons of the year for irrigation purposes, we had water during 1889 and 1890 and

along there. Of course I don't remember the dates exactly, but whenever there was a sufficient amount of water in the river to be used or that was available for the ditch it was used. During the ten years prior to 1904, as to whether there was a sufficient amount of water in the river for irrigation purposes and for that ditch, I will say, well, most of the time there was. As to what extent the
7047 amount of water had decreased that I spoke of and as to what extent it affected the amount in that ditch, I will say, well, along some time during those years, I couldn't tell the exact date, we only had water when there was a flush time in the Arkansas river. During the irrigating season for the most part we were dry; and that lasted for six or eight years prior to 1904. I should say that during the six or eight years prior to 1904 there was sufficient water in the river to supply that ditch for irrigating purposes for the greater part of the year. It was during the dry season of the year that there was not an abundance of water. (Objection.) No, sir, I should think that there was not as much water during the dry season of the year for those six or eight years prior to 1904 as there had been during the first six or eight years when the
7048 ditch was constructed. I should say not.

If the flood waters of the Arkansas river could be stored in reservoirs either in Colorado or Kansas so as to supply those ditches in Hamilton county with a sufficient supply of water during the dry season for irrigating purposes, it would have a tendency to increase the value of our bottom lands, and if water was distributed in those valleys it would increase their productiveness.

The Collier ditch was originally dug 12 feet wide on the bottom, and it would carry a couple of feet of water, and had about a 2½ foot grade, I guess, the first mile, and after that probably 5 feet to the mile. The Alamo ditch was larger, but I don't know its size. Perhaps 15 or 20 feet on the bottom. There are two Alamo ditches now; that is, two headgates to the Alamo ditch. They both
7049 belong to the same company and the headgates were taken out of the river a distance of eight miles apart on the meandering of the river—six or eight miles. The upper ditch was probably fifteen feet wide and the other wider, something like 20 or 25 feet, and these ditches were two or three feet deep and had a grade of about 2½ feet to the mile. Yes, sir, there are other ditches in that county—the Occidental ditch, taken out on my place, and there was a ditch below that that I don't remember the name of; and besides that there were a couple of ditches, or one anyway, taken out on the east of Syracuse. These are all small ditches, and I mean by small ditches ten or twelve feet wide on the bottom and carrying about two feet of water and having about the same grade as the others.

Cross-examination.

By Mr. HAYT:

7050 I located in Hamilton county in 1885, yes, sir, and we had very successful seasons in those years as I remember. We had a good deal of rain, yes, sir. Well, it was claimed that crops could be raised here without irrigation, and we did. I raised some crops without irrigation. Yes, during those two years the river ran quite a volume of water. I would not like to say that there was more water during those years than any other years of my residence in Hamilton county except the last two years. I would not like to assent to that or dissent from it. I don't know. I think we had several years along there that there was quite a flow of water in the river, but I am satisfied that in 1885 and 1886 we had a pretty abundant flow of water in the river. Yes, sir, according to my recollection now there was as much water in the
7051 river during those two years as during any year since that time.

I would not attribute the fact that my hay crop has been less of late years to any other reason than that there has been less water in the river. I could not. I was referring to wild hay. As far as that is concerned, I could grow alfalfa on this land. Wild hay I can get every year, yes, sir. No, sir, I have never reseeded it. I feed on it some in the winter. No, sir, I never turn my cattle upon it to graze, not in the growing season, no, sir, nor in the spring. I take them off before the grass starts in the spring, generally. Well, they might graze there a very little in some portion of the year, yes, sir.

I have irrigated some of my lands in previous years. I am not irrigating just now. It has been three or four years, I guess four years, since I have irrigated. Yes, sir, in my judgment
7052 it is necessary to irrigate land in Hamilton county to get the best results from farming. You can raise different crops and a larger number of crops by irrigation, yes, sir. We can raise a great deal more feed or any other kind of crops under irrigation than without it.

I could hardly say what lands are worth in my county under ditch with a sufficient water supply. There is none of it selling. Yes, sir, there is plenty of water now for the ditches if it were turned into them—plenty. The latter part of 1904, probably from the first of June, we have had plenty of water in the river, and where the ditches were in shape there was plenty of water in the ditches.

As to how many irrigations are necessary to grow alfalfa successfully upon my land, I would say that we ought to have three irrigations during the season. I have had no experience in growing any crop except alfalfa under irrigation, except gardens. As to how many crops we can raise with three irrigations, I would
7053 say we cut our alfalfa three times and then have quite a little

for grazing. This alfalfa I spoke of was seeded in 1883. No, sir, I never plowed up the ground or re-seeded it since that time. It needs it now, though.

As to whether during the last ten years there has been water enough in the river so that my lands might have been irrigated if the water had been turned into the ditches, I would say at intervals only. No, I would not say that I could have irrigated it two or three or four times during the season. Whenever the river was full of water or there was a flood in the river we could have irrigated, but that lasted only a few days at a time. Yes, in 1904 we could have irrigated nearly all the time, and so far as this spring is concerned we could have irrigated all the time, yes sir.

7054 No, there is no dam at the head of our ditch. The intake of this Frontier ditch is pretty near the line between Kansas and Colorado. Yes, sir, that is the nearest ditch to the line. That is what I meant when I said the first ditch taken out of the river in the State of Kansas is the Frontier ditch. As to whether I know as a matter of fact that for the last eight or ten years there has been plenty of water in the river to have supplied that ditch during the ordinary irrigating season, I will answer that the conditions at the head of the Frontier ditch are very different from the conditions of any other ditch in Hamilton county. I am apprised of the fact that the ground water ditch has had water in it when other ditches were dry; and as to the owners of the ground water ditch being satisfied with the amount of water they are getting, I will answer, they have an advantage in securing water, that does not belong to any other ditch in the county. Yes, sir, they have the water to secure at that particular point. Not particularly on account of the con-

7055 formation of the country, but they take their water out of the river very near the mouth of Sand creek, and the ditch in Colorado there—I forget the name of it—dumps its water into Sand creek and it runs down Sand creek and the Frontier ditch folks get it. That is about the size of it.

Yes, sir, I know what is meant by return waters from the irrigation of lands. I have seen the effects of that to some extent. Yes, sir, I know there is such a thing as return waters. As to whether the irrigation of large bodies of land with a slope or drainage toward the river acts as a reservoir or sponge to hold the waters back for a time and gradually allow them to escape, or a portion of them, to the river, I would answer, I have seen the effect of that to a limited extent, yes, sir. Yes, sir, there are a good many active wells, run by windmills or other power in the vicinity of Syracuse—

7056 quite a good many of them. It would be a matter of guess with me as to how many, but probably a hundred wells in Syracuse and vicinity, and those wells are run all the time during the irrigating season and the water is pumped from this ground water or underflow that I spoke of, yes, sir. There are no wells in Hamilton county pumped by steam power or gasoline or anything of that kind, not at this time, I think.

Yes, sir, I certainly am in favor of the use of the water of the Arkansas river for the purposes of irrigation. It is very much to the advantage of the people of western Kansas that the water of the Arkansas river should be used for the growing of crops by irrigation. Yes, sir, I think so. And in my judgment that is the most valuable use that the water could be put to. As to the further development of the country by means of irrigation and the extending of the irrigated area by pumping from the so-called underflow and in other ways getting the water to the surface, I would say any means that would distribute the water over the surface would be to the advantage of the country. Yes, sir, I have taken some interest,

7057 I suppose, in the plans of the Federal Government as outlined by Professor Slichter with reference to a pumping plant above Garden City. I have heard of this effort of the Federal Government. As to whether I think the water can be raised there in the manner outlined and used for irrigation that would be of great benefit to western Kansas, I will answer, it would depend somewhat on the expense that is attached to an effort of that kind. If the expenditure does not exceed the value received. It is an experiment.

Surely lands that are irrigated will raise very much more than lands not irrigated, and there is no reason why lands in the vicinity of Syracuse should not be as productive and valuable as lands in Colorado in the vicinity of Rocky Ford and other places where cultivation by irrigation has been brought to a high standard of perfection, that I know of, except the want of water.

Yes, my lands and the lands about me are as valuable at this time as they have been at any time in the past, with the exception of perhaps two or three boom years. I should think they were. But lands have not depreciated in our country, especially lands susceptible of irrigation.

Redirect examination.

By Mr. ASHBAUGH:

7058 As to being able to get some water for the Collier ditch and the Alamo ditch at intervals for the last ten years, and as to whether there were times of sufficient regularity and certainty of water to warrant us in relying upon irrigation for that ditch, I will answer, no, sir, there was no certainty or regularity about that flow.

Yes, I spoke of the Frontier ditch having its headgate right near the mouth of Sand creek. I can't say that Sand creek has anything of a regular flow. The Amity ditch dumps its surplus water into Sand creek. The presumption is that it percolates through the sand and is a benefit to the Frontier ditch, and there are localities on the Arkansas river where there is perpetual water. The headgate of this Frontier ditch is located at a place of that kind. It is a matter of presumption that the water for the Frontier ditch comes

from the surplus water of the Amity ditch running down Sand creek and finding its way back to the river.

7059 As to windmills not lowering the underflow, I would say, well, I have so thought.

As to Mr. Slichter's proposition being located here, that is in Finney county, just a few miles west from Garden City. There is no such proposition in Hamilton county that I know of.

Recross-examination.

By Mr. HAYT:

Yes, sir, there are places where the flow of the river is perpetual, and one of these places is at the head of the Frontier ditch. As to other places farther down toward Garden City, I will name them, certainly. I will name a point immediately south of Syracuse where I have never seen the river dry, while it has been dry for months above that and below it; and there is another point three or four miles east of that on the south side of the river. I think Mr. Ford took his water out of the river at a place of that kind. Those are the only three points that I know of in Hamilton county.

7060 As to whether or not there are return waters at those points from irrigation, I should think not. They were there, as far as I know, prior to irrigation.

EARLIE OVERTON, Garden City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

7061 I live six miles south of Syracuse in Hamilton county and have lived in Hamilton county since 1879 and at that place about six miles south for about six years. From 1879 down to about six years ago I lived most of the time on the river bottom south of Syracuse. I have been acquainted with the Arkansas river since 1879.

The bottom lands along the Arkansas river in Hamilton county are on an average I should suppose about a mile and a half to a mile and three-quarters wide. In some places they are wider and in some places narrower, extending back a mile and three-

7062 quarters at their widest place on each side of the river. The distance back to the uplands on each side of the river is about the same on the average.

Yes, sir, I know what is understood by the people of Hamilton county as the underflow. As to how far back from the river it extends, I couldn't say. It extends back to the bluff, though, I know. As to how far back from the river the volume of water in the river has an effect upon the underflow, I should think about a mile and a half, yes, back to the bluffs. As to whether the underflow back to the bluffs responds to the condition of the river, rising when the

river rises and falling when the river falls (objection), I would answer, yes, sir.

I am familiar with the hay crops that originally grew on the bottom lands along the Arkansas river, and during the last ten years prior to 1904 in comparison with the hay crops of earlier years they have been a good deal lighter, and this is on account of the low water, I suppose, in the river.

7063 As to how the average flow of the river for the last ten years prior to 1904 would compare with the average flow of the river for the first ten years I knew it, exclusive of flood periods (objection), I would say, there is not nearly as much water. As to whether the taking of the water for irrigation purposes in Colorado has a tendency to increase the amount of water flowing in the Arkansas river through Hamilton county during the dry portion of the year (objection), I would answer, no, sir, it has not. As to whether there has been a greater flow of water in the Arkansas river in Hamilton county during the dry seasons of the year for the past ten years prior to 1904, I would answer, no, sir.

As to whether the taking of water for irrigation in Colorado has tended to equalize the flow of the river through Hamilton county, I would answer, I don't think it has. It has not been quite as high in high water; it has been a good deal lower in dry seasons.

7064 I am acquainted with the ditches in Hamilton county and helped dig some of them. I helped dig the Alamo in 1888. A part of that ditch, known as the upper Alamo, was dug prior to that time, about 1882 or 1883, and the water was turned in in June of either 1882 or 1883, yes, sir. As to whether there was a sufficient supply of water in the river to supply that ditch for six or eight or ten years after it was dug, I would say, yes, sir, there was. That ditch was originally twelve feet wide at the bottom, 3 feet

7065 deep, with a grade of 3 feet to the mile. There is also in that county what they call the Frontier ditch. I think it is about the same size as the other—about 12 feet. I think it was dug about 1900. Speaking of the earlier ditches, yes, sir, I know something about the Collier ditch. It was dug in 1883 or 1884. It was about 12 feet wide on the bottom and 2 or 3 feet deep, and about a 3-foot grade. I think that is all the ditches I can think of now.

If a former witness has testified that the influence of the river does not extend back more than 500 or 1,000 feet from the river (objection), I should think he was mistaken about it. I know

7066 it makes a difference about a mile and a half back, and I don't know how much farther, but that far at least, yes, sir.

Cross-examination.

By Mr. MILLER:

The reason I fix the limit at about a mile and a half back is that that is about as far back as I ever dug wells. That is right at the edge of the bluffs, yes, sir. Yes, sir, I fix the underflow as reaching

that limit. I have seen it rise two or three feet in a well that far back when the river would be up. Where I dug those wells would be right next to the hills, a mile and a half. As to whether
7067 the water stands higher in the wells near the hills or higher next to the river, I would answer, if the river is up about a week it will stand about the same. For a short rise it will be deeper in the well close to the river. As to how many wells I have experimented upon, I couldn't say. A good many. We have been putting up hay on the river for a good many years and dig shallow wells to water teams. No, sir, I never ran any levels or made any accurate measurements to know that the water stands higher in the well next to the river. I am just judging by the lay of the ground and the height that the water rises in the well. As to the number of wells that I dug, I would answer, I could hardly say. We used to dig three or four about every year for the last fifteen or twenty years, I expect. No, sir, we never ran any levels. Yes, the land does gradually rise as you go back from the river. It generally does. As to whether that would make the water appear deeper down in the ground than if you were near the river, I would answer, it would be a little nearer the top of the well in the shallow one, but it would rise about
7068 the same distance in each well. But whether one would be judging from the appearance from the surface of the ground down to the water, I would answer, no, by the distance that it rises in the well. Sometimes it would be a foot higher in the well. As to whether we measured it, I would say we used to have a barrel sunk. We never measured it exactly, but we would sometimes have a box or barrel in there, and that would be a foot up over the boards.

Yes, sir, it is a fact that the entire drainage of the Arkansas river ranges for a number of miles south and a number of miles north in Hamilton county. The creeks most all run in on the north side anyway. On the south side they most all—— As to whether that rain water all comes into the river over the surface of the ground or some of it from springs or by percolation, I would answer, it generally runs in through the creeks over the surface of the ground.

I first settled in Hamilton county in 1879. That was at a point adjoining the town site. No, sir, I didn't during any of those earlier years see the river dry at points along in Hamilton county. No, sir, I never did. I first saw the river dry in the fall of 1888.
7069 That was the first year it was ever dry to my knowledge. As to whether I have seen this water which we call the underflow at points away from the river reach a higher point than the surface of the river, I would answer, in the sloughs I have seen the water stand, yes, sir. It is higher there.

I am a stock raiser, and a farmer to the extent that we raise "roughness" for cattle. By that I mean cane and kaffir corn mostly, and I have been raising this roughness about fifteen years and upon the same land without rotating or fertilizing. As to

whether that would tend to account for the diminution in crops, I would say on that land I don't see that there is any difference. I think it is about the same. As to whether it is — recognized
7070 fact among the farmers that it is necessary to rotate crops or rest the land or fertilize it or do something to keep its productiveness up, I would answer, it might be better. We never pay much attention to it, though. Yes, sir, I know it is a recognized fact that it is necessary to either rest the land or fertilize it.

Yes, sir, these hay crops I speak of are simply wild hay. My land is fenced. The hay bottoms are about all fenced. Of the wild hay we cut just one crop a year, and that is cut the last of August and September. As to whether we pasture that land after we cut it, I will answer, mostly they don't. I don't handle any of this land myself now. We didn't use to ever pasture it, though. I am six miles from the river bed. No, sir, I don't handle any hay,
7071 not now, nor I don't harvest any hay at all.

As to whether the land in my neighborhood has been going up or down in value, I will say it has been about the same, I think. There hasn't been much land sold for a number of years now.

I worked on the Alamo ditch in 1880 and 1889, and when we built that ditch we had water for it, yes, sir, the first two or three years. Yes, sir, we found the use of water for irrigation beneficial to the land, increasing the crops and making our labor more productive and remunerative, and I consider that irrigation through Hamilton county has been beneficial and advantageous to this part of the State, yes, sir, and the application of water to such purposes has added largely to the value of land and been a benefit to the citizens, and I think that would be the highest possible use and the best use you could put the water to. Yes, sir, I claim that
7072 after we used this ditch in that manner and appropriated the water to the land and raised crops in that manner that gradually the water diminished and ceased so that we didn't have it to use through the ditch, and I attribute the falling off of the crops largely to the failure to obtain a supply of water for irrigation.

I think the first alfalfa was grown in Hamilton county in 1884, and the practice among the farmers since they first seeded their land in alfalfa has been to break it up and re-seed it, and a great many have plowed it up. I think they have made a practice of doing so every definite number of years—say eight or ten years. A good many of them. Some have not. Some have disced it and cut it up. Yes, sir, they have plowed up the alfalfa, and a good many of them have re-seeded it. As to whether that is a crop that gradually runs out unless you plow it up and rest it or re-seed it, I think so. It seems to get thinner in five or six years. It has done so,
7073 yes, sir. Yes, sir, there will be spots where no alfalfa will grow, and it gets so that the roots will get immensely large and don't produce hay.

Yes, sir, I have dug a few wells here in late years, and I generally on the low bottoms go probably from five to six feet for

water during the summer months, say during June and July. I think the level of these bottom lands from the bed of the river would be on an average five or six feet above, and I think this distance would correspond with the distance we sink for water, yes, sir.

In saying that I never saw the river dry previous to 1888 but since 1888 have seen it dry, I was referring to the river in Hamilton county, yes, sir, and as to that being a different condition than has been witnessed elsewhere through Kansas, I will say in eastern
7074 Colorado it has been just about the same, and as to farther east in Kansas, the water where the springs come in, there will be a stream for a ways in some places and then it will gradually sink away in the sand and be dry again, and as to that being the condition in the earlier years where I spoke of the conditions of the stream supplied by the waters coming into the river, I will answer that the streams back from the river are about the same now as they ever were—the creeks. As to why the stream always remained permanent and constant previous to 1888 and afterward went dry in spells, I suppose the taking of the water out west caused it. I don't know what else. No, sir, I never generally observed during the first years I was here that at times the Arkansas river went dry at places previous to 1888. I never saw it dry before 1888. As to whether I will say it did not go dry in the years before 1888, I will answer, never since I knew it it didn't. Yes, sir, I was up and down it much previous to 1888. I have worked up and down the river for quite a distance. As to whether I will say positively that the
7075 stream has not been dry east of Hamilton county previous to 1888 at different periods during that year, I will answer that I never saw it dry east of Hamilton county before the year 1888. No, sir, at no time during the year 1884 did I see it very low, but there was a pretty good head of water, as we call it now. As to whether previous to 1888 wagons would drive across it and it would be necessary to sink wells in the sands of the river to get water to water their stock, I will say I never saw it that way before 1888. Yes, sir, I was in the stock business previous to 1888. No, sir, it was not necessary at times to get water in that way. I have heard of stockmen seeking water in that way, yes, sir, years ago, but never saw it. As to whether through talking with old settlers or other persons who had knowledge concerning this river I know that it was necessary when the old Santa Fe trail existed for teamsters and drivers to sink wells in order to obtain water for their stock and horses (objection), I think I have read something of the kind. I never saw a man that had ever done it, I don't believe. I never heard one say that he had.

Redirect examination.

By Mr. ASHBAUGH:

7076 In reply to a question by counsel that the water had risen two or three feet in wells back at a least mile and a half

from the river, as to whether that rise was from rain or from the condition of the river, I will answer, it was from the condition of the river. There had not been any rainfall to amount to anything. Yes, sir, the water in those wells would and did rise when the river would rise if there had been no rain at all. (Objection.)

Recross-examination.

By Mr. MILLER:

7077 Yes, sir, I suppose that it is a fact that every river has what they call a ground water that reaches back from the river some distance until it strikes the first bluffs or the first resistance. As to whether those waters commonly called underflow waters by the people here or ground waters by other persons come from the river or whether they don't come from the same source as the river water does (objection), I would say, I couldn't say as to that. As to being positive that this underflow water comes from the river, I would say it gets higher in the wells when the river is up and lower when it goes down. Supposing it is the same thing as the river itself, as to whether it would not go up and down with the river, I would say, it does, yes, sir. If it came from the uplands, as
7078 to whether it would be up when the river went up, I would say I hardly think it would. If it came from the hills it would be pretty apt to seep up when the river was up, along the bluffs, I should think.

7079 JAMES CRAIG, Garden City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

Yes, sir, I am the witness who testified on behalf of the State of Kansas in chief, and I had something to do with the digging of some of the ditches in Finney county. I had to do more or less with three different ditches. I was superintendent of the Great Eastern for six years, in fact I carried the rod when it was surveyed; then I became superintendent of that ditch and had charge of it up to March, 1886.

As to the Kansas ditch, I lived under it and helped to build it, and I had stock in it in the early days. That Kansas ditch is now what is called the Farmers' ditch.

I have done some levelling work on the Garden City ditch in the last two or three years, and did some work on it in extend-
7080 ing the mouth of it farther up the river at one time. The Farmers' ditch heads in Kearny county and runs into and through Finney county. The irrigation under the Farmers' ditch is all in Finney county.

Beginning with the ditches that are farthest west and coming down the river, naming them in their order (objection), I will say the Amazon would come first, and the Great Eastern next, and

what we call the South Side ditch next, and then the Kansas ditch, and then the Garden City ditch.

Yes, sir, the Western ditch has its headgate almost opposite that of the Great Eastern. As to the size of each of these ditches and their carrying capacity at the time they were completed, I will say the Amazon would be first. I put the tape line on that. I had never anything to do with it any more than simply measuring it.

It was 15 feet wide at the bottom, with a slope of 1-to-1, and
7081 I should judge the average depth to be about 3 feet. It would carry about 3 feet of water at Hartland. Where we measured it it is through high cuts. The grade of it is 18 inches fall up toward the head. I have no doubt it has a greater fall than that below. They generally drop the fall after they get out on the flats. The Great Eastern has a 3-foot fall, 20 feet wide at the bottom, with a 1-to-1 slope. When I quit the ditch it would carry about 2½ feet of water. That was in March, 1886.

The Western ditch is 20 feet wide and would carry 2½ feet of water. The grade is very heavy when it gets away from the head. My recollection is that at the head it has a 3-foot fall, but when it gets away from the head it has a 5-foot fall. It runs right down the valley.

The Kansas ditch was made 25 feet wide in 1883, with a
7082 2½ foot fall and a 1–to–1 slope, and is 2½ feet deep.

The Garden City ditch was 15 feet wide at the bottom, with a 2½ foot fall and about 2 feet deep. I don't believe that I could put all of the ditches together so as to give the total carrying capacity. It would take considerable figuring. There are different falls there that must be taken into consideration in figuring it up. My recollection is that it would make a ditch something like 108 feet wide, with vertical sides, a depth of probably 2½ feet and an average grade of about 2½ feet. One of them has a grade of 3 feet. I would not attempt to figure it out as to how much a ditch 108 feet wide
7083 with vertical sides and of that depth and grade would carry in cubic feet. I think if I had been prepared I could have figured it out, probably. Between 600 and 700 second-feet, I should judge.

I am not acquainted with the ditches in Hamilton county, only just seeing them in passing along the road. In Kearny county there are three ditches that head there—the Amazon, the Great Eastern and the South Side—and the Farmers', for that matter. They all four heard in Kearny county. There might be some of the Syracuse ditches run down into Kearny county on the west side of it, in the bottom. It is possible, but I don't think there is.

As to the total number of acres of land that could be irrigated from these five ditches that I spoke of, in Finney county, it would be a wide guess. It is thousands of acres. All the country
7084 east of here could be watered so far as it goes. A man might call it a hundred or two hundred thousand and still be inside of that. Those ditches, some of them, will empty into the head of

the Pawnee, away out in that country; some of them will go into Scott county. The Amazon, for instance, goes clear up into the basin. No, sir, I am not familiar with the size and carrying capacity of the Soule or Eureka ditch. Mr. Soule was up here to see me at Lakin when we were putting in the piling there, but I don't know about the ditch.

Cross-examination.

By Mr. HAYT:

Yes, sir, I am quite an enthusiast in favor of irrigation. I believe in it. I believe the prosperity of this country rests almost entirely upon irrigation. Yes, sir, certainly. We would have no Garden City here, practically, without it. It would be like a great
7085 many other little towns—it would have dwindled out. Yes, sir, I believe in using all the water in the river that is available for the purpose of irrigation. As to the value of farming lands under ditch with a good water right in this county (objection), I will say good farming land improved is worth about $40 an acre. No, sir, I don't know of any reason why that land cannot be made as valuable by intensive farming here as land at Rocky Ford and other places in Colorado. I think it can be made as valuable as any land in the world. I think with proper cultivation this land can be made worth $600 or $700 an acre. It certainly could with the proper amount of water. No, sir, I would not favor and the people here generally would not favor any doctrine that would prevent the use of this water for the purposes of irrigation. Certainly not. I think it would be absolutely destructive of the interests of the people of western Kansas.

As to the values of land here compared at the present time with values in previous years, I would say land is as high here as it has been at any time; that is, in our country, three miles north of town. Yes, sir, I believe it is as high here now as it was during the boom of 1885 and 1886. I believe it is higher around my
7086 place there than it was in the boom days. I believe my farm will bring more money today; and as a general thing land is now very much higher than it has been in the past, outside of these boom years of which I have spoken, yes, sir. (Objection.)

7087 EDWARD H. HUDSON, Garden City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live at Newton, Kansas. I have been a great deal around Garden City in previous years. I came here on the 26th of March, 1882, from Illinois, coming out to investigate the country. Yes, sir, I had something to do with one of these ditches in Hamilton county. I had a party composed of Illinois people, and myself among the number, purchase the Kansas and what is known as the

Garden City ditch. The Garden City ditch when we purchased it had probably been dug two or three years. I have forgotten just the dates. We purchased it in 1882. The Garden City ditch
7088 was very small—a mere thread of water—at that time. We enlarged it to about fifteen feet at the bottom, with sloping sides of 1-to-1, and my recollection is that it would carry about three feet of water at the dam in depth and the grade varied in different parts of the ditch somewhat, but at the dam the grade would be between two and a half and three feet. We didn't dig the Kansas ditch originally, but we bought it in 1882 and it had been in existence over two years, I think. Yes, sir, we enlarged it, mak-
7089 ing it at the bottom either 23 or 25 feet, is my recollection, with sloping sides. At ordinary times I think it would carry 2½ to 3 feet of water in depth, and the grade was about 2½ feet to the mile. No, sir, I had nothing to do with any of the other ditches. I think the other ditches have always carried water, as I understand it, ever since that time. My interest in the ditches ceased about 1888 or 1889.

Up to that time there was always sufficient water, I think, after a short time in the early summer of 1880, probably. My observation is that from about that date, 1889, there was a diminished supply until within the last year or two when I paid but very little attention and don't testify to that time.

Cross-examination.

By Mr. HAYT:

7090 Yes, sir, there was a shortage of water in the spring of 1882 For a short time it was very dry. There was not a very large amount of land under irrigation at that time under these ditches. I couldn't even approximate the number of acres. It is too long ago for me to do that. No, you can't say there was very little in comparison with the amount under irrigation at the present time. There is not as much now. I should say about one-half or one-third as much, something like that.

Yes, sir, I had seen the river prior to 1882. I don't know the exact point where I saw it; I couldn't tell you at what different points. I know I saw it at Hutchinson and other points. No, I hadn't crossed it frequently prior to that time. I had been
7091 out in Kansas, I think, twice prior to 1882. Yes, sir, I first saw the Arkansas river at Hutchinson, and that was in 1879 or 1880. One year about that time. I couldn't say as to the river getting very low frequently during the early part of the season during the earlier years. At this particular time I speak about it was a very dry year in Kansas. I don't recollect as to whether at that particular time the river was entirely dry in places, but I do recollect it was very low. No, I don't remember that I had any impression at the time I first saw the river as to its character. (Objection.)

My opinion is that it is not necessary to irrigate in order to raise the majority of crops successfully in western Kansas. For some crops it is and for some crops it is not the only sure way of
7092 producing a crop west of the 100th meridian, taking one season with another. I think cane and kaffir corn and some kinds of wheat it is not necessary to irrigate at all. Whether it is absolutely essential or not for the raising of grain and the growing of trees and the raising of vegetables, I would say I think it is mighty desirable. Yes, sir, I think it is about the best use to which the water of this river could be put, undoubtedly.

As to the effect that the irrigation of large tracts of land has upon the climate generally with reference to the humidity of the atmosphere and the increased rainfall, I would say that is a scientific question. My own opinion is that there is more humidity in this country than there was twenty years ago—a good deal more. Whatever causes it, I couldn't say.

7093 I. N. McBeth, Garden City, Kansas.

Direct examination.

By Mr. Ashbaugh:

I live at Garden City, Kansas, and came here in 1886. I am in the grain and seed business, and am president of the First national bank here. Our seed firm is McBeth and Kennison. I went into the grain and seed business in the fall of 1890. Our business consisted at that time of dealing in alfalfa seed and other grains, cane, millet, oats, wheat, rye and such grains. There was an appreciable amount of oats raised in this country at that time, yes, sir, quite a good deal. At the present time or for the last three years
7094 there has been but very little. As to why that is, well, from lack of water in our ditches. We shipped our oats that we bought in those early years to Arizona and New Mexico, and as to the extent to which oats was raised and that we shipped in those days, I couldn't say positively, but we shipped along in 1890, 1891 and 1892 several car loads of oats, probably ten or fifteen or twenty, somewhere along there. I could not be positive. No, sir, oats have not been raised to any considerable extent since about 1893 here, and for the reason I have given.

As to the flow of water in the ditches from the time I came here in 1886, for a few years after that it was very good, and was good until probably 1892 or 1893, along there. Since that time, for the purposes of irrigation the water in the ditches, there has been a very light run of water. No, sir, not sufficient for irrigating the lands that could have been irrigated if there had been plenty of water. As to the flow of the river outside of flood seasons for the years from 1892 down to 1904 as compared with the flow of the river from 1886 down to 1892, I will say it has certainly not been

nearly so good except just in high or flood water times. At
7095 other times it has been very much less, yes, sir. As to whether the appropriation and use of water in Colorado for irrigation purposes has tended to increase the amount of water in the river during the dry seasons (objection), I should say it certainly has not. As to the appropriation and use of the water of the Arkansas river in Colorado for irrigation purposes equalizing the flow of the river from 1892 to 1904 by decreasing the floods and increasing the amount of water in the river at the dry season, I should say, not when our river would be dry at those times. As to whether the level of the underflow in the city of Garden City is as high now or has been for the last ten years prior to 1904 as it was during the first ten years after I came here, I should say from my observation I think not.

In 1886 I built a house in the west part of Garden City and dug a cellar, and I dug down five feet and dug into the water. The
7096 cellars now that have been dug, so far as I understand, run about eight feet. In digging wells or anything of that kind we dig down about seven or eight feet to get good water. I should say we dig now on an average two or three feet lower than we did in the early years—something like that. That is the general condition in Garden City. As to what effect it would have upon the bottom lands of Finney county if the surplus water of the Askansas river should be impounded in the State of Colorado, or in western Kansas if reservoir sites could be found, and used in the ditches of Finney county, it certainly would have a good effect. It certainly would be a great advantage to this country.

7097 As to other crops that I know of in our seed and grain business, as to whether they have been subject to a similar change or falling off in these later years, I will answer, all other grains except probably alfalfa seed have fallen off to as great an extent as oats. During the first five or eight years after I came here our principal crops were oats and barley. Those crops were very good when irrigated. When we had water to irrigate them they were first class, and they were first class along about 1892 or 1893. Yes, sir, the barley crop fell off in proportion to the oats crop. There is a good deal more barley raised now in the county because there has been a bigger acreage ordinarily. It has been raised on these irrigatad lands, but the crops are not so heavy as in those early years, and oats has been pretty nearly a failure. Oats is something that needs a good deal more water than does barley.

Cross-examination.

By Mr. HAYT:

7098 No, sir, there are no crops that have increased in late years over the production of the earlier years. I don't know that there are. No, sir, we don't raise anything here that we didn't

raise during the earlier years, unless it is beets. We are raising beets.

Yes, sir, the country is fairly prosperous at the present time. In some ways it is as prosperous as it has been at any time in its history, except during the boom years. No, sir, I would not think that property is held as high throughout the county as at any previous time, and town property is nothing like as high. Town property is now as high or higher than it has been at any time during the last ten years; but it is not within fifty per cent. as high as it was in the boom times. No, sir, I have not recently purchased town
7099 property here. Well, as to whether or not our bank purchased a corner here within the last two or three years on a contract, I would say we did on a contract that was made probably six or seven years prior to the time we took the property. As to how we hold that property now as compared with the prices of six or seven years ago (objection), I would say we hold that property at probably a couple of thousand dollars more than the purchase price of it. As to what we regard as the value of lands under irrigation in this county where they have a reasonable amount of water for irrigation, I would say, I suppose in the neighborhood of $40. Compared with the lands not under irrigation, I would answer, lands not irrigated sell from probably $3 to $5, that is, the high or flat lands.

Yes, sir, we are strongly in favor of irrigation here. We are in favor of the use of the water of the Arkansas river for the irrigation of lands in Finney county, yes, sir, and in other places where
7100 it can be put to beneficial use. I should say so. Yes, we would be in favor of using all of the water of the river economically for the purposes of irrigation if necessary. Yes, I think that is about the best use it could be put to. We would not need so many dikes on the lower Mississippi then, probably.

As to my stating in answer to counsel that I didn't think the taking out of the waters in Colorado in flood times would have any perceptible effect in the diminution of the water in the river here (objection), I would say if I did I don't remember it. As I remember the question, it was, except in flood times. That was the way I understood the question to be asked. And as to my making an exception now and intending to make it at first, I would say no, sir. I said with the exception of flood times. The question was
7101 asked by counsel for Kansas, if I remember right. As to what effect it does have in flood times to take out the water in Colorado, I couldn't say in ffood times whether it does lessen the flow or does not, as in flood times our river runs full and overflows here. Oh, yes, I think in flood times water enough could be taken out in Colorado so as to affect the ffow here. It might affect it some, so far as I know, but I couldn't say whether it does or does not. But I suppose the more you take out there the less will come down, undoubtedly. As to what I meant when I said the use of the water in Colorado did not tend to equalize the flow here, I would answer, in

dry times. That was the way the question was asked, as I understand it. I said I didn't think it did, as our river was dry. As to what effect I think it would have upon the river in Kansas to take this water out in flood times and store it in reservoirs in Colorado and use it for the purpose of irrigating large tracts, several hundred thousand acres, of land in Colorado with a drainage toward the river, in the way of creating seepage or return waters that would have an effect upon the river at the State line in times of low water, I couldn't say. I can only say that I don't think it has done
7102 so. (Objection.) I don't think it has done so at the particular point, no, sir. Yes, sir, I suppose there is some return water from irrigation or some seepage water that gets back to the streams, ordinarily, but I can say that our river since 1892 has certainly had a great deal less water in it than it had prior to that time.

Yes, sir, I located here in 1886. Yes, sir, that was a wet year. I was not here in 1885 and don't know anything about that year. In 1886 the river was as high as it has been at any period since. I think it was. And we had an abundance of rainfall, yes, sir, considerably more than the average rainfall. Yes, sir, that is true.

7103 No, sir, I don't know from what I have heard from others that at the time I located here that that was true, in 1885. I may have heard them say it, but I don't remember it. No, sir, I don't remember whether 1885 was considered a dry or wet year in this country, because I didn't come here until February, 1886.

Yes, sir, I spoke of digging a cellar in 1886 and finding water at five feet. No, sir, I don't know how that water is now in that cellar. As to knowing what the depth is here to the water level at the present time, I will say it is seven or eight feet down. I wouldn't say exactly right now how that would be, at the present time. I haven't dug down for probably a year. Yes, sir, I know the river has been pretty well up for the last five or six years, and I have been down to it where I could see it, yes, sir. Yes, sir, it is overflowing the road this side of the bridge. Yes, sir, that is true.

7104 Yes, sir, we had what might be termed a full river last year, along in the latter part of the year, probably along about this time. I think in June, possibly, with very excessive floods. Yes, sir, the river was high. As to whether I noticed that had any effect on this ground water at that time, I will say, yes, sir. If the river rises here generally the water rises in the ground. No, sir, I didn't notice any place in town in any of those cellars that the river did have that effect last year, and I haven't noticed it this year, no, sir. Yes, sir, I think that where the town is now located it is much drier than the first year I came here, in 1886. I think the water level, except just in high flood times like this, is lower generally all over the country. As to why that water level has not been elevated recently by the increased flow in the river, I think it

has. That water level is higher now than it used to be if the river was full of water. That is my opinion. No, sir, I have not
7105 heard any complaint here lately of water being in the cellars here in town. I don't know as I have. No, sir, during none of this high water of last year and this year have I heard such complaint. I don't think I have. And I have made no investigations, no, sir.

In regard to the rainfall for the last two or three years being greater or less than the average prior to that time, I would say two years ago I think it was about as high a year as we have had in several years, and in last year, 1904, it was very dry up to about the 15th of May. In the present year we have had a greater amount of rainfall up to this time than we have had in several years.

As to whether the cultivation of this land, the growing of crops and the irrigation of the land to the west has any perceptible effect on the climate here to increase its humidity, in my judgment, I would say I don't believe it has. As to what I base my hope for the future prosperity of this country upon, I would say upon getting plenty of water in our ditches. That is just what I think is the salvation of this country. That has its tendency, unques-
7106 tionably, to build up our town and our county. Yes, sir that in my judgment is the best use this water can be put to.

Redirect examination.

By Mr. ASHBAUGH:

As to whether this county is now as prosperous and has been as prosperous for the last eight years as it would have been if the water had remained in the Finney county ditches the way it did for the first six or eight years after I came here, I will answer, no, sir, it is not. I think the taking of that water very materially decreased the prosperity of this county.

Recross-examination.

By Mr. HAYT:

No, sir, there has been no increase in the acreage under cultivation by irrigation during the last ten years. I think it has been the other way if anything. Yes, sir, I stated that we had plenty of water up to 1893 in the ditches. As to whether
7107 anything occurred at that time to make the demand for this water less, in the way of a panic that spread over the country, I would say, no, sir, I think not. The reason they didn't use the water is because they didn't have it to use. Yes, we had a depression over this country in 1893, as there has been all over the country after that boom. This country was not excepted as to the boom any more than any other that I know of. No, sir, it was not very severe in 1893. I don't know as it was any more severe than it was in 1896 or along there. Yes, sir, I know we had a severe panic in

this country in 1893. We had a depression in the price of property, and it lasted a number of years before it recovered, yes, sir. As to the fact that during that time these ditches fell into disuse, I would say it was because we didn't have water enough. Yes, they fell into disuse for that reason. As to whether the ditches were allowed to fill up and were not cleaned out for a number of years, no sir, I don't say that. They were cleaned out.

7108 Yes, sir, I mean that the Amazon and Great Eastern were kept in shape to carry water during those years from 1893 to 1900. I think they were kept in such condition as to carry water—all the water they had to carry. Yes, sir, I saw those ditches during all those years. No, sir, I don't know that they were allowed to fill up with debris and silt for a number of years and were not cleaned out at all during that time. I don't think that is true, no, sir. Yes, sir, there were dams at the heads of these ditches, the same kind of dams that they are using today. They were made of sacks of sand and dirt thrown up, and piling put in, as I understand it. No, I don't think those dams were kept up during the years from 1893 to 1900, not as good as they were prior to that time. As to my knowing as a matter of fact that they were not kept up during those years, I will answer, simply because we didn't have the water to go into the ditches. As to our having had some non-resident ditch owners that would not put up the money to keep the ditches in repair, I will say I think they were non-residents, yes, sir. As

7109 to the fact that they would not put up the money to keep the ditches in repair, I don't know that that was true. Yes, sir, I know as a matter of fact that the farmers had difficulty to get these non-resident ditch owners to put up the money to keep the ditches in repair. Yes, sir, they had some difficulty, and some of the farmers were compelled to reorganize these companies and did reorganize them in the last three or four years. I think the farmers own the ditches now. Yes, sir, and as soon as the farmers succeeded to that ownership of these ditches they spent a large amount of money, labor and time in putting the ditches again in repair. They have been working on the ditches and making better repairs.

I don't think there has been any shortage of water this year up to the present time. No, sir, there was no shortage of water last year, except perhaps in the spring, I think they had a very fair flow of water last year. I think it takes something like three or four irrigations, ordinarily, to raise a crop of oats in this vicinity. As to two irrigations being sufficient, with the ordinary rainfall that we have here, I would answer, in some years we have more

7110 rainfall than in others. Yes, sir, in some years we have rainfall enough to raise oats without irrigation. Yes, in some years it would be true that two irrigations, with the rainfall, would be enough to carry us through. No, sir, during all these years there has not been enough water in the river at different times to irrigate this land two or three times. I think not. Yes, sir, I think the water was always turned into the ditches when it was run-

ning in the river and available for that purpose; during the irrigating season it certainly was.

No, sir, I have not been a farmer myself in this county, but I have farmed some in Ohio and Illinois. No, sir, I have never farmed in Kansas. I have raised cane and such as that out on the flats, taking our chances on the rainfall. Sometimes we would get a crop and sometimes we would not. But that is the extent of my farming in Kansas.

No, sir, it is not a matter of fact that they are shipping just as much farm produce away from here of late years as at any time in the history of the city. We haven't shipped a carload of oats out of this town since about 1892 or 1893. We have shipped
7111 considerable wheat in 1902 and 1903, but that was all raised outside of irrigation, or practically so. The last two years we have practically raised no hay or alfalfa. The cause of the failure in 1904 was that we had a very bad grasshopper year and we had a very dry time from August, 1903, to the 15th of May, 1904. The grasshoppers came along I suppose in June, 1904, along about this time. It may be a little later or a little earlier. Yes, sir, I want to be understood as saying that this country in the vicinity of Garden City is not as productive and has not been as productive during the last two or three years as it has been during any other time for the last fifteen years. That is what I said. We have had a shorter crop in the last three years than we have had in—yes, sir, we have had very short crops.

Values have somewhat increased, you might say, in the last ten or twelve months, and they have increased quite rapidly, yes,
7112 sir. Oh, no, I wouldn't say that some of this land has doubled and trebled in price in the last ten or twelve months. In some cases I suppose it has trebled. You take cheap grazing lands up on the flats, I suppose it is true they have doubled.

Redirect examination.

By Mr. ASHBAUGH:

Cheap grazing lands were very low here for a long time, and they are now being picked up by speculators, generally, yes, sir. No, this does not extend to the bottom lands to any very great extent; only very little.

As to whether the ditches went dry because they were out of repair or whether they were out of repair because they had gone dry and had been dry for some time (objection), I stated they were dry because we had no water to run in them. That is my statement.

Cross-examination.

By Mr. CAMPBELL:

7113 I have been in the banking business in Garden City about four years. No, sir, it is not a fact to any great extent that the deposits of the bank have increased during these last three or

four years, and to answer positively, I couldn't say whether they are any greater at this time than they were four years ago according to the statement rendered to the Comptroller of the Currency. There are two banks here now. One was started about the 15th of the month, I think. Only in the minds of the people who organized that bank does it show that the community is more prosperous than it was three or four years ago. Well, I would say no, that is not a pretty good barometer of the prosperity of the community, knowing what I do know. Probably it is true that that opinion, that the community is more prosperous, prevails in the minds of those who organized the bank.

DODGE CITY, KANSAS, June 1–3, 1905.

7114 L. J. PETTIJOHN, Dodge City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I am the same witness who was called and testified on behalf of the State of Kansas in this case — its testimony in chief, and am re-
ceiver of the land office at Dodge City. As such receiver I
7115 have the records of that office in my possession. Yes, sir, I referred in my former testimony to the width of the Arkansas river at different places. I have since that time reduced to figures the widths of the Arkansas river at the points near Dodge City. The width of the Arkansas river in feet at Dodge City, as shown by the records in my office (objection) is 1,528 feet; at Syracuse the width is 1,160 feet; at Garden City, 1,181 feet; at Kinsley, 1,904 feet. This width at Kinsley is two miles south of the town, on the section line between 16 and 17, township 25, range 19. At Great Bend the width is 1,584 feet; at Larned, 1,486 feet.

Cross-examination.

By Mr. MILLER:

7116 I take these figures from the plats in the office, and this width is the width of the river as shown by the records; that is, the width from one bank to the other as shown by the records of the land office, in chains. No, sir, I don't know the date when those measurements were taken. I have been in the land office for seven years, and they were not taken since I have been in that office. The plat which indicates these figures was filed in the '70's. I don't remember the year. And so far as I know the figures were put on the plat then, yes, sir. Yes, the width of the river here is 1,528 feet. That point is located just south of the town, on the section line east, and that distance is from bank to bank as shown by the records.

7117 No, sir, I don't know whether the bank now corresponds with the records or not. I have lived in Dodge City a little

more than seven years, and the river was no wider in the length of time I have known it than it is now. I think it is about the same in the last seven years. Previous to that time I lived in Garden City for a year or a year and a half, and before that down in southwestern Kansas, but not on this river any place, no, sir.

Cross-examination.

By Mr. CAMPBELL:

No, I don't know the exact date when the measurements were taken. They were taken from the plats. Yes, sir, it is supposed that they were taken at the time of the extension of the public survey over the public domain out here. As to whether the measurements are correct, I have only the records to go by. I don't know that it is a fact that a great many of these measurements, and especially meandered lines along a stream, are incorrect. I
7118 don't remember that I ever heard that statement made. I think the surveys are let out to contractors. They bid and agree to do the surveying for a certain amount of money. That is my understanding. I do not understand it that way—that the least work the surveyors do the more money they can make. (Objection.) I don't believe I have ever heard of any complaint or assertion made around here that these meandered lines on these streams do not follow the banks of the river. I don't remember that I have heard their accuracy questioned at all along the Arkansas river.

Recross-examination.

By Mr. MILLER:

7119 Yes, sir, the width of the river I refer to is the width between the meandered lines on each side, and the width between those lines is not necessarily the width of the water itself, no, sir. Yes, sir, I am simply testifying from what I see on the plats in my office, that is all.

Redirect examination.

By Mr. ASHBAUGH:

Yes, sir, I introduced those records when I was on the stand before (Complainant's Exhibits A–9, A–10, A–11 and A–12), and those plats showed that they were made in the '70's, but I don't remember just the year. I think it was 1872.

7120 JOHN RINEY, Dodge City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Ford county, Kansas, a mile west of Dodge City, on the north side of the river, and on the south side of the Santa Fe railroad. The Santa Fe railroad at that place runs about three-quarters

of a mile from the river, and my house is about a quarter of a mile from the railroad and half a mile from the river. The land between the river and the railroad is bottom land. The Santa Fe railroad runs, you might say, right against the slope. I own three quarter sections of land there, and have lived there about twenty-two
7121 years. This *this* would be about 1883, and I have lived there continuously, excepting one season. I can see the banks of the river from my house. I have to go down to the banks to look into the river. The lands between the railroad track on the north and the river on the south are level.

Yes, sir, I have a well—one at the barn and one at the house. I had an open well when I first came there, but
7122 now I have got pipes or pumps. They are driven down. The water in that well at my house changes its level at different times. (Objection.) It changes considerably at certain times of the year. I suppose it changes there from three feet—in fact I never dug down after I put in those points, you know, or pumps. As to what causes that change of the water in my well, I would say, that is, when the river goes dry. When the river goes dry, as to what effect it has upon my well, I will answer, the water settles down as the river goes dry, and when the river is full then you might say it is up around the cylinder in the well. That well is half a mile or a little over from the river. As to how far back from the river the underflow extends, I will answer, that
7123 this comes clear back—I don't know how far, but it comes clear back to my house, and I don't know how much farther. Yes, sir, in the flood it goes beyond my house, but I expect it will go a little deeper, because the ground rises a little, gradually, but there wouldn't be much difference. Yes, sir, it goes back practically to the uplands, and that would be about three-quarters of a mile from the river.

As to the average flow of the river, exclusive of flood periods, for the ten years prior to last year, compared with the ten years that I knew it (objection), I will say there is a whole lot of difference. There is one thing, when we generally have our June rise that is the only time we expect any water—in June—when the snow melts in the mountains, and it don't stay with us as long as it did before. It disappears quicker.

7124 As to the average flow of the river, exclusive of floods, for the ten years prior to last year being as large as it was during the first ten years I knew it, I will say, no, sir, it has not been. As to what effect the falling off of the water during these last ten or twelve years has had upon the productiveness of my lands, I will say, it has a whole lot with me. In the first place, I used to have a hay field down there and used to cut a great deal of hay on it. For the last ten years I have turned it into grazing pasture, and am also tilling or farming it, because it didn't produce grass enough to pay me. It was not producing the grass it had when I first went there. As to why it didn't, I would say, it didn't have that sub-irrigation.

As to how far this condition extends up and down the river, I expect all along the line as far as I know, to Colorado. As far as I know. Everybody I hear, you know, I hear complaining of it.

Yes, sir, I am acquainted with the lands three or four or five miles down the river similar to my lands, and the bottom lands along the soldiers' home. As to how the loss of water has affected the productiveness of these lands, I will say it has affected them just the same as it did the rest of us up here. As to what
7125 effect the taking of the water in Colorado during the last twelve or fifteen years for the purposes of irrigation has had upon equalizing the flow of the river, I will say it has decreased it in the dry seasons. (Objection.) Since I have lived here the length of the period of low water has increased during the dry season, yes, sir. (Objection.)

During the last fifteen years the banks of the river have changed. One thing, we don't have the same amount of water, so it seems to me, and there are more islands, and it don't seem as wide as
7126 it was. It don't have the amount of water, you know, and keeps cutting down the banks the same as it did years before. Yes, sir, there are more islands in the channel of the river now than there were fifteen years ago. It has made several islands up there by my place. They have at the present time got trees and grass both on them. Some have and some haven't. On some there is a lot of young trees coming upon them now. This condition extends pretty nearly all along the river up and down here.

Cross-examination.

By Mr. HAYT:

I came here in 1883 from Kit Carson, on the line of Kansas and Colorado, and I emigrated to Kansas from New Hampshire. I can't remember the exact year I came, but have been in this
7127 town over twenty-three years. When I first came west here I wasn't located hardly any place. I was just following up the line of railroad from Hayes City, and I think I was doing that about two years, until I got to Kit Carson. I don't know what year it was when I first saw the Arkansas river. Yes, I remember seeing it lots of times before I located here at Dodge City in 1883. I saw it at old Las Animas. Now, I don't know whether that is in Colorado or Kansas. It is the old town. Yes, sir, in those earlier years before I located near this point I saw the river frequently from the State line of Colorado on down below Dodge City, more or less. No, sir, I never saw the river dry during those earlier years. I have seen it when it was a whole lot lower, but there was
7128 always a pretty good stream in it—always running water. No, sir, not to my knowledge this river didn't go dry in those earlier years. I don't know as I have ever heard from the old settlers that the river was dry in those earlier years, no, sir. (Objection.) No, sir, I never heard that the buffaloes had left this country

at one time on account of the lack of water for drinking purposes. (Objection.) I never heard that mentioned. No, sir, I never heard of stock perishing along the river in this vicinity for lack of water prior to the time I located here. (Objection.) No, sir,
7129 I never heard from any one going up or down the river that they had to dig for water for their camping purposes and for their stock. (Objection.) Oh, I have heard something about it previous to hearing it mentioned in this question, but I don't know as it was along the Arkansas river. I couldn't say where. But I have heard of them driving stock to and fro and driving a good ways for water, but I have never heard them mention that it was in the Arkansas river, to my knowledge. Yes, sir, I have heard of them driving stock, but couldn't say whether it was the Arkansas river or where it was they wanted water. (Objection.)

7130 No, sir, I don't recollect dates very well, but it was about twenty-three years ago when I located here. I ought to have a pretty distinct recollection of the river in 1882, the first year I located here. I have been located here all these years.

I can go down to the river from my house in a few minutes, and my business takes me down there more or less every day toward the river. No, sir, from my house I can't see the water in the river at an ordinary stage, because there are more trees now grown up—more trees along the bank. And during those early years there was not a tree, hardly, at all, on this side of the river. No, sir, I couldn't see the river at a low stage from my house then. As to whether I especially observed it during those years with a view of watching it as to whether the water was increasing or diminishing, I didn't watch it, but I know the river was dry, and I suppose it was because Colorado was taking all the water from us. Yes, sir, I say I "suppose" it was because Colorado was taking all the water.

7131 No, sir, I have not been up in Colorado since they commenced making those ditches. No, I was not up in Colorado in the '80's. I believe there were small ditches going into small places there, but not to amount to anything, and all I know with reference to their taking water in Colorado out of the river is what I have read in the papers and know by experience that somebody is taking it, and I suppose Colorado is taking it and holding it. Yes, sir, we all complain of their taking the water above. I have heard some of them complain in the vicinity of Garden City or Syracuse in western Kansas that they don't have as much water now as when they first started. Yes, sir, we hear them complain because they were taking water out in western Kansas—about both places. Now, as to whether I want this water taken out for the purposes of irrigation either in Colorado or western Kansas (objection), I should say of course where I am located I should sooner see the water stay the way it was years ago. No, sir, I don't want
7132 the water taken out. As to whether I am opposed to anyone withdrawing the water of the Arkansas river above me

for the purposes of irrigation (objection), I would say, well, that is right. There has been plenty of water in the river this year and the flow has been abundant since away last fall—some time in the fall. For the last six weeks there has been a very large and
7133 continuous flow of water in the river; and as to how wide or how deep the river is opposite my house at the present time, I don't know. It has been pretty deep, in fact I have never been into it, but I know it is pretty deep. No, sir, the flow on the average from last August up to the present time has not been as great as the flow during the entire year for the same months. Well, in the spring of the year—well, no, it has been greater this year than I have seen it for several years. Taking those months together, ten months, the flow has not been as large as during ten months of any other year. I couldn't give you the dates or year, but for instance take it from 1890 to 1895, along in there, I know we would have right smart of water in the river all the time, but of course we would not have quite as much as we
7134 have now. Yes, sir, we had a good deal of water during those years all the time. No, I don't think there was nearly as much water during the last ten years as there is now. No, sir, I don't remember how the flow was during the years 1884 and 1885. I couldn't say whether the river went practically dry in the fall of 1884.

Yes, sir, this well I have spoken of is located near my house. It is just on a level with the house, and my house, I should judge, is from three to four feet higher than the top of the banks of the river. I have but this one well, that is all, and I dug that soon after I located there, yes, sir. As to the size of that well, I
7135 expect it was probably three feet square, and it was curbed up, yes, sir, and I used it as an open well there for several years; then I got my windmill and I drove the point down when I put up the windmill, fifteen feet. Yes, sir, after I put up the windmill I could see the water in this well; that is, after I dug the last joint down the river came right up. We could see the water right in the pipe. We drove down close to the bottom of the well and then we put on our length of pipe—four-foot joints. As to how far I could see beneath the surface of the ground after we put this drive well in and it began operation, the water was right on top of the surface of the ground where I quit digging for the cylinder. No, I couldn't see the height of the water below after I put on the pipes, of course not. No, sir, that has not been the condition for a few years. It
7136 is not the condition now. It was not the condition then when I first put it in. As to whether I can see the level of the underflow now in that well unless it comes near the surface, I will say I can see it now right in around this cylinder. As to how far it is open below the surface of the ground, I would answer, I expect it is down there about—in the first place I dug down about three feet and later on I dug down, and probably it is down now about four

or five feet or six feet. It is so that I can reach my hand to it from the top of the ground now. Yes, sir, I mean to say that at this time I can see from the top of the ground down into the well for a distance of six feet. It is open down—an open place there dug for the cylinder about four or five feet below the top of the ground, yes, sir.

I never knew I was to be a witness in this case at all until this morning. No, I don't know as I am subpœnaed. As to who
7137 I talked with this morning with reference to his testimony, I would say, I met my attorney here and he told me what was up—or the attorney for the State of Kansas. As to whether he represents me and other citizens of the State of Kansas, I will say I don't know as he did, much. Of course he wanted to know how long I had lived here, and I told him, and there were very — words passed between us. No, sir, I never talked with anyone else with reference to the evidence in this case. I didn't even tell the attorney what I would testify to.

No, sir, I never ran any levels or made any measurements to determine the height of my well with reference to the water in the river. No, sir, I never made any investigation in the way of a survey to determine the level at my house above the level of the water in the river or above the level of the bottom of the river. I
7138 never made any investigation in reference to these matters, no, sir. I am simply testifying to my best recollection of the matter during those earlier years.

We have raised corn and we are raising alfalfa and a little barley and oats from these lands, outside of the grass I have spoken of. No, sir, we didn't usually have a crop of corn each year. I have quit trying to raise corn. We can raise barley some years and some years we don't raise any. But I do raise alfalfa.

As to the value of my lands having increased during the last two or three or four years, I would say I expect it has increased. Yes, sir, my lands are more valuable now than they have been in the past. Yes, right now they are of more value, and I hold
7139 them higher than at any other time since I located there. I always cut a little hay there, about fifteen or twenty acres, every year, but outside of that I don't cut any, and this year I haven't got any outside of those ten or fifteen acres. That hay is always pretty fair there because it is lower than the balance of it.

Yes, sir, this is a wet year.

No, sir, I don't know about the crops raised at the soldiers' home near town here last year. I saw them, but didn't pay much attention. I don't know whether they had a very good crop there last year, but I heard someone say it was not as good, but as far as I myself am concerned, I don't know.

Redirect examination.

By Mr. ASHBAUGH:

Yes, sir, my land runs right down to the river.

7140 As to why I quit raising corn, I will answer, because we couldn't get any corn any more after the river went dry. As to whether the going down of the river affected the raising of corn, I will say that is what we laid it to, because it would burn out every year on me after that. Some years I could raise a pretty good crop of barley. If it happened to be a wet season I would raise barley on it, and if wasn't I wouldn't.

As to the rains upon the uplands back from the river having any effect upon the rising and falling of the water in the river, I will answer, no, sir.

Recross-examination.

By Mr. HAYT:

The rains on the uplands didn't have much effect on the river. As to the effect of this flood a few days ago in one of these creeks, I will say of course the creeks and the overflow water will affect the river some. A heavy rain will affect the river some, but some rains will not have any effect on it.

7141 Oh, yes, when we have a big rain here it does affect the river some. As to what affected the river and made it full of water for the last six weeks, I expect it is the amount of rain that has been falling in the mountains and all around that has had an effect on the river this year. No, I don't know that the snow has not commenced to melt in the mountains to any considerable extent up to the present time. It is about that time we look for our rises, generally, from the mountains. Generally about this time of the year.

No, sir, I have not raised any corn in late years, and as to whether I am too far west for the successful growing of corn, I will say, of course we don't expect to raise as good corn as they do farther east, but at the same time we can raise pretty fair corn here. Yes, sir, we are outside of what is known as the corn belt. Well, no, we are not too high up and have too little rain for the purpose of raising corn. I believe if we have the overflow there we can get that sub-irrigation from the river that will grow corn all right. Yes, sir, if

7142 we get the overflow we can grow the corn all right in that bottom. As to whether I know as a matter of fact that the corn belt on the east does not extent west this side from Hutchinson, I don't know, but they claim it any way. Of course I don't know it myself, but they claim that. As to whether my experience in this country has taught me that corn cannot successfully be grown in this vicinity, I will say, it is not the best corn country. Yes, sir, I have about fifteen acres in hay and the balance of my land is in alfalfa, cane and kaffir corn. I guess I have got pretty nearly 200

acres or over now under cultivation. This year, of that small grain I haven't got any in, because I am getting my ground ready for alfalfa. I have some corn in this year. I am trying it this year on account of there being much more water in the river. I thought I would try some more corn this year. Yes, sir, I have a little over 200 acres in cultivation. There are about 125 acres of that in a good stand of alfalfa, and the balance, probably 70 or 80 acres
7143 of alfalfa that I put in this spring. This 125 acres of alfalfa of which I have a good stand, I put in some of — last season and some of it probably fifteen years ago—the oldest of it. Last spring I put in about the same amount I did this spring. I had to re-sow it from last spring. Yes, sir, I first commenced to raise alfalfa fifteen years ago, and I have gradually increased the acreage, and it is about as profitable as any acreage right now at the present time. I expect it brings, ordinarily, $5 or $6 a ton. I have to haul it here to town for that. $5 a ton in the field it has been fetching.

Redirect examination.

By Mr. ASHBAUGH:

When I spoke a few moments ago in answer to a question by counsel in regard to what I mean by the words "sub-irrigation" and "overflow," as to whether I meant overflow or underflow (objection), I will answer, I meant the underflow from the river water.

7145 J. H. MILLER, Dodge City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live at Dodge City, Ford county, Kansas, and am sheriff. This is my second term. I have lived in Dodge City fourteen years, and in Ford county twenty-one years, settling here in 1884. I settled down here on the Mulberry, which is a tributary of the Arkansas river on the south side and flows into the Arkansas river about twenty miles east of here. I was located about five miles from the Arkansas river. As to how wide the Arkansas valley is
7146 there, I should say, possibly, on both sides of the river, it would be about a mile. This valley is composed of what we know as first bottom lands. The first year after I settled on Mulberry creek I wasn't doing anything but proving up on a claim. After that I was in the livery business in Ford City there, which is on the south bank of the Arkansas river. Yes, sir, I know Mr. Sidlow and know where his place is. I was possibly eight miles from Mr. Sidlow's. Mr. Sidlow was one of the witnesses who testified here on behalf of the State of Colorado. I am also in the livery business in Dodge City and am well acquainted with the Arkansas valley and the Arkansas river through this county. The valley back to the uplands through this county, in width, would run a mile or

more, in some places not so wide and in other places wider.

7147 As to how the average flow of the Arkansas river, exclusive of floods or flood seasons, for the last ten years would compare with a similar flow for the first ten years that I knew it, I would answer, I don't think we have as much water in the river. As to the falling off being material and noticeable, I will say I could notice it. It made quite a difference. It made quite a difference in the price of hay. I buy a couple of hundred tons of hay a year, and have for some years past. That hay was raised on this river along the river bottoms. The falling of the river has made the hay scarcer and I have had to pay more for it. Yes, sir, it has made the hay scarcer and lighter crops.

Yes, sir, I know what is known as the underflow here. I hear them talk about it. As to what effect the falling of the water

7148 in the river has upon the underflow, I will say, I am not posted on the underflow. I suppose by the falling of the water in the river the underflow would be lowered. Men tell me down here twenty-three miles from here where this artesian country is that they can tell the time the river is up from their wells. As to how far back from the banks of the river the river affects the underflow, I will answer that I never paid any attention to that and I couldn't say. I think it makes a difference in the crops through the width of the valley, and I suppose all over the meadows. They don't get the crops they used to. They get half a ton to the acre where they used to get a ton or over; these meadows are half a mile to a mile wide and extend back to the uplands.

As to whether the taking of water for the purposes of irrigation within the State of Colorado for the last fifteen years has had the effect of increasing the flow of the river through Ford county at the dry season (objection), I will answer that I don't think it has

7149 increased the flow. I think it has decreased the flow. (Objection.) I don't think we have had the water in the river that we used to. I think there has been a shortage for the last eight or ten years. As to whether the taking of the water in Colorado has tended to equalize the flow, I will answer, no, sir, there hasn't been a greater flow in the dry season.

I am acquainted with the State lands at the soldiers' home. As to whether the same conditions I have described as to hay lands extend to the State lands at the soldiers' home, I will answer, well, they certainly would just the same.

Cross-examination.

By Mr. MILLER:

7150 The State lands run right to the river; and by State lands I mean where the soldiers' home is located. I don't know how many acres they have. They have been adding to that on the high lands and there is some bottom land. They must have about

480 acres of bottom land at the present time, and possibly more. I think the original tract was 160 acres of bottom land.

Yes, sir, there are some dry irrigating ditches about Garden City. I don't think they were ever used for irrigation. I don't think anybody ever used them. They might a little when they were first put in. I don't think these lands have ever been experi-
7151 mented upon to any extent with irrigation, any more than a garden spot, to my knowledge. No, sir, I don't know whether it would improve their productiveness or not. I don't think anybody has irrigated here to amount to anything. I think they irrigate some at Cimarron. I know they do a little. That is twenty miles west of here. Yes, sir, there was water turned into these irrigating ditches about Dodge City, and it was used for irrigation on a small scale, I think.

I have lived in Ford county twenty-one years, and before coming here I lived in Illinois, in Mason county.

Prairie hay and alfalfa are the kinds raised in Ford county. Alfalfa hay is worth $5 or $6 a ton, or $8, and the wild hay about the same price. Yes, sir, that wild hay is what is commonly
7152 known as prairie hay, and it runs from $5 to $8 per ton.

Looking out of the window here to the south, I would say that it is a mile from the south side of the river to the hills, maybe a little more. No, sir, it is not as far to the hills on the north side here.

The river has been running as full as I see it here today for five or six months. Not as full as it is today. Part of the time it has been. Yes, sir, this is what one would call a large volume of water in the Arkansas river. I don't think it comes from the melting of the snows in the mountains. I don't know. I haven't been up there. No, this is not quite the season for the heavy water from the melting of the snows. Almost the time. Yes, sir, it is true that some years ago we always had two rises in the river during
7153 the summer—one in the early part and one later. Yes, I believe one rise is all we have had in later years, and sometimes we don't have that—some years. As to what has caused that change, I don't know that I could positively say, no, sir. No, I don't know that it is true as a matter of fact that the same condition is true in the inter-mountain streams themselves. I don't know that to be true—that on account of the cutting off of timber and otherwise changing the surface of the mountains so that when the warm rain comes first in the year it cleans off this snow at once and does not give us the second rise. I haven't been out there.

Those artesian wells I spoke of are twenty-two to twenty-three miles from here to the first ones back. I think they usually find water there at 75 to 150 feet. Going back five miles from the river here I think you would probably get water at 75 or 80 feet, and that would be on the first uplands. Yes, sir, and then you would get a good flow of water. Yes, sir, you can find
7154 water by sinking wells as far south as the State line. Yes,

sir, I think there is an underground water lying all south of here. No, sir, I don't know anything about the thickness of the sheet of water, and I don't know how far it is through the volume of it. I don't know as I can explain more fully the variations of the water in these artesian wells as the water increases or diminishes in volume in the river. I have had those men tell me they could tell whenever the river was up by the flow of the wells. When the river was up the wells were stronger. Yes, sir, these artesian wells bring the water to the surface without any pumping. I don't understand that these other wells back from the river where you pump to bring the water to the surface are artesian wells.

7155 Yes, sir, there are other wells there than the artesian ones, and as to how far they go to get water, that depends on the location. If you start from the river here you gradually go up to the divide, and then you gradually go down to the next creek. When you get up on those divides it is 150 or 175 feet, and then it would taper off until you get to the river or the creek south of there. I think you could get water back through these first uplands, take it a mile back, to the south of the river, within twenty-five or thirty feet.

When I compared the quantity of water during the last ten years on an average with the ten years previous I meant the ten years previous to 1895. Not any more water than there is today, no, sir, but I have seen more water in the river than there is today. I have seen it last year also when there was more than there is today, yes, sir, during some of the big floods, and I think those floods came from rain waters too. One of the

7156 largest that was traced down here came from the Purgatoire, yes, sir, which runs from toward Trinidad, and one also went down to Wichita that came from streams north and east of here. That is my understanding. No, sir, you can't always reckon that a large flood in the river here is caused by mountain waters; not the large rises.

As to the rise in the price of hay in the last few years and the scarcity of the water, I will say, you can't get the amount of hay off the land that you could when I first settled in this country. No, sir, they have not been pasturing these wild hay lands that are used for meadow lands. Well, some people do after the hay has been cut off in the fall, and some people never pasture them at all.

As to whether they have been in the habit here of restoring the alfalfa by planting it again or by plowing it up and reseeding it, I would say, where it would stand they would leave it alone. As to whether it is the history of alfalfa that it will gradually thin

7157 itself out as it becomes aged, I don't know that if it does. No, sir, I haven't been acquainted with alfalfa for a very long time.

No, sir, I never experimented with this underflow by sinking wells and making measurements and running levels across the country. This is just a popular notion I am giving as to the rise

and fall of this underflow with the volume of water in the river. Yes, sir, I have made no experiments or measurements.

Redirect examination.

By Mr. ASHBAUGH:

In looking at the valley from the window here I would say it is about a mile from the south side of the river to the foothills beyond, and on the north side it would reach back a quarter of a mile from the river to the court house here. Yes, sir, there
7158 are islands down there in the river that we can see from the court house, and as to how long they have been there, possibly some of them have been there ever since I have been in this country, and some of them have been made in the last few years. I should say the biggest portion of them have been made within the last ten or fifteen years, and they have grown over with trees and vegetation during that time, yes, sir. The trees on those islands are twenty or thirty feet in height, and mostly cottonwoods, and they have all grown within the last fourteen years.

7159 Recross-examination.

By Mr. MILLER:

I don't know when the cottonwood was imported into this country Yes, sir, I found it here when I came. Yes, sir, once in a while we saw one. It will grow along in the water ways, yes, sir, and spread itself by seeds.

7160 CHARLES HERZER, Dodge City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live now in Dodge City, and have lived in town just a few months. Prior to that I lived in Ford City, twenty-five miles east of here, on the north side of the river, and lived there about twenty years. I moved to Ford in 1884. My business was farming. My land borders on the Arkansas river. I have 500 acres now, or have had for the last few years. That land borders on the river
7161 for about a mile and three-quarters. There is about 200 acres along the river, and balance runs back in the second bottom. The river extends along my land for half a mile. The valley there is about a mile wide on both sides—about half a mile on each side. The first well that I dug on my lands I dug about ten feet to water. That was not quite half a mile from the river. It was on the bottom lands, what we might call second bottom. That well lasted probably four or five years, and we used it all the time. I then dug two or three more. They were pretty nearly in the same surroundings, not far apart. The first well I dug about
7162 fifteen years ago, or about 1890. Oh, yes, the level of the

water in that well varied. We attributed that varying of the water in the well to the river going down, not having sufficient water in the river. The effect of the river going down was that we had to dig the well deeper, and we did dig it deeper. I think about ten years ago we went down four feet deeper, put a curb in and sunk that down and had an 8-inch pump put in it, and we then found water. I should think the level of the water between the time I dug that well and the time I lowered it had fallen about four feet. As to whether the water in that well would go up and down according to the condition of the water in the river (objection), I couldn't say as to that now. I think it has a great deal to do with it, of course. I know when we first
7163 dug the well and I had that big pump put in we couldn't pump it dry, and later on, five years later, the well wouldn't supply the water for the pump. We had to dig it deeper. As to the other wells, we didn't dig those. We only dug down perhaps five feet and then we drove the pipe down. When we dug down five feet we didn't strike water. We didn't go to the level of the underflow. I mean by the underflow, if the river is down we didn't have the amount of underflow there. If the river is down the level of the underflow is not as near the surface on my land as when the river is up. No, sir, it is not. As to what effect the falling of the underflow had upon my bottom land, I will answer, it wouldn't produce the amount of hay. Principally along the river I have got hay land, and the effect of decreasing the underflow was that it decreased the productiveness of those hay lands. As to how far back from the river it had that effect, I would think it was half a mile.

7164 Mr. Sidlow's land is about six miles or maybe a little more from the river. If you go down on the south side of the river you can strike it in six miles. That is what we formerly called the Sidlow land. Mr. Sidlow sold out two or three times there, and he had two or three places there, but I remember now the old Sidlow land that is on the north side of the river. I presume it is between seven and eight miles. We had to cross below what we called the Frontier ditch, and that is nearly eight miles.

As to how the flow of the river, exclusive of flood periods, for the last ten years compared with the flow of the river during the first ten years that I knew it, I will answer, the first ten years we had a great deal more water, in fact we had water all the time, whereas the last ten years the river has been dry a good deal of the time so that you could walk across it. As to whether the taking of the water in the State of Colorado for the purposes of irrigation during the last ten or twelve years has had the effect of increasing the amount of the Arkansas river through Ford county during the dry season
7165 (objection), I will answer, the fact as to the taking out of the water there, that is what we presume. I haven't been in Colorado. We presume that was the cause. If most of the water is taken out there, of course it would decrease the water here. As to whether

the water in the river during the dry season of the year for the last ten years has decreased or not, I will answer, it has decreased. As to the width of the river between the banks during the last ten or twelve years, it has narrowed. It has made land on both sides you may say. At the time the Government survey was made the river, from what I have learned, was between 1500 and 1600 feet at my place down there. (Objection.) And I had a survey made—the reason that I know it—last summer, and the river is down to between seven and eight hundred feet; that is, the width of the river. I think that is a fair proportion of the narrowing of the river along by Ford. As to the channel of the river during the last ten

7166 or twelve years, I will answer, it has filled up. It is not as deep as it was. There are some little islands forming here and there, and they have been forming for the last ten years, and I think they have grown in size and are grown over with grass, vegetation or trees. No, sir, the carrying capacity of the river to carry off the flood waters at Ford is not as great now as it was twenty years ago. I don't think it would carry more than half the water now that it would twenty years ago. I have had some experience in that. It overflows my bottoms now and it didn't then in a freshet like this. Now, the other day my bottoms were nearly all under water.

7167 The trees I spoke of on those islands I would say are ten to twenty feet high, and I would presume they have been growing about ten or twelve or fourteen years. I am not sure. I have not paid much attention to that, but that would be my judgment.

Cross-examination.

By Mr. HAYT:

Yes, sir, there were very few trees along the river when I first came here, and there are a great many at the present time. No, sir, that is no detriment to the country. The people are very glad to have the trees grow. They think that is one of the advantages that have accrued from the settlement of the country. But as to those trees, now, the first hay I cut on this land we found a great many stumps that we were told the early settlers had cut the timber off the river. Right on the land that I own now. I didn't own it then; I had it rented then. And I know I had a great deal of troubling in mowing once in a while because they would

7168 tear the sickle to pieces or this or that. We would run against a stump and I would say "Certainly there has been some trees here, there has been something done here." Well, they said the early settlers cut the timber out. I don't know whether of late years the settlers have been very careful to protect the growing timber as far as possible. I have had a good deal of trouble once in a while when I would catch fellows in on my land cutting cottonwoods, and certainly I do my best to protect the cottonwoods on my land, and every other farmer does the same thing in this vicinity.

The first well I put down I raised the water with an 8-inch pump, and that pumped worked by windmill, and I had to go down about ten feet below the surface of the ground on the bottom land to find the water. Yes, sir, after that I put down other wells, and I raised the water by windmills, the same. Yes, sir, I had two wind-
7169 mills in operation at the same time on my place. Yes, sir, when I first located there windmills were rather unusual in that vicinity, and now there are a great many. Nearly every farmer and nearly every householder has a windmill for the purpose of pumping water to the surface, yes, sir, and that is true not only of the farmers up and down the river but it is true to a large extent of those living in the little towns; Yes, sir, in Dodge City where we now are there are extensive pumping plants for the purpose of pumping water to the surface from below. One of them is operated by the Atchison, Topeka & Santa Fe railroad, and one is operated by the water company of the town of Dodge City. No, sir, I don't know how much water
7170 is raised each day by this pumping plant operated by the water company. As to how many windmills or other power of that kind are operated for the purpose of pumping of water to the surface between Dodge City and my place, going back in width as far as the valley lands go, I presume there is in the neighborhood of thirteen, as near as I can count, between here and Ford, twenty miles, that is, in the bottom lands, and I think there are two or three times that number on the lands farther away from the river. No, that is not true on the other side. On the other side there are not so many, because they haven't got the settlement.

I don't know much about the irrigation either in Colorado or western Kansas. I have never been into Colorado. Yes, sir, I have been beyond Garden City. I have been at Hartland, and I think that west of Dodge City they rely upon irrigation for the
7171 growing of general crops. I would think so. As to the place where I live, and its being necessary to irrigate in order to grow successful crops, I would say we have no way to irrigate. As to whether or not I am in favor of taking this water out for irrigation either in Colorado or Kansas (objection), I don't know as I could answer any question as to that. I don't know as I
7172 would be against it in Kansas particularly as long as the water wouldn't be carried off too far so that we could get it back into the river or a good part of it. Yes, sir, I am willing that they should use this water in western Kansas for the purposes of irrigation if they don't take it beyond the lands that drain toward the river. As to whether I would apply this same rule to irrigation in Colorado (objection), I would answer that in fact I can't say anything about Colorado. I have not been there. But I would not object to using the water in western Kansas if they didn't take it beyond the lands drained by the river, as long as it wouldn't diminish the water here, so that it would leave some water in the river. (Objection.) As to whether I would be opposed to the use

of the water for irrigation in the State of Colorado provided the water is used only to irrigate lands which drain into the Arkansas river (objection), I would answer that as long as the water
7173 wouldn't be taken all out of the river, so that it would leave us a proportion of the water in the river, I wouldn't be opposed to it. As to whether I think it can diminish this underflow I speak of so long as it is not taken from the lands draining into the river, I would say I think it would. I think it might have that effect, yes, sir. My reasons would be, if there is not a sufficient amount of water in the river there wouldn't be a sufficient underflow. That is, we experience that by our wells. Whenever we have plenty of water in the river we have plenty of water in the well, and if there is not plenty of water in the river we couldn't have so much water there. We would have to go down
7174 deeper. Yes, sir, I think some part of this underflow is supplied by the falling rains upon the lands adjacent to the river and the uplands immediately beyond. I think it is. If this water is taken out and spread upon the lands I think it would help some to supply the ground water or what we call the underflow.

I don't know as I can answer how the flow of water in the river has been at my place for the last ten years. I have been in Ohio nearly all winter, until just a few months ago. I was there nearly all winter to see to my brother's affairs. No, sir, I didn't see the river at any time during the month of August. I was called away the latter part of May last year, and returned two or three times. About the time I would get back here I would get a dispatch to return to Ohio. I think I got back about the first of September from Ohio, to the best of my recollection, but I don't know how the water
7175 in the river was. I think I saw it in September and October, and after October I can't say. No, sir, I didn't see it in November. I went to Ohio again in that month. No, sir, I didn't see it in January, and I came back here about the first of March. Yes, sir, I saw it in March. I have seen it several times between the first of March and today. As to the condition of the river from the first of March to this day as to running water, I think we have had—well, we have more now than we had then, I think, but I didn't pay any particular attention to the river at that time. I know for the last six weeks we had plenty of water. Yes, sir, we have had a full river for that time, and it has overflowed my land in places down below. As to whether it has damaged my hay lands or not, I don't know as it would do it much good. It would
7176 carry the sands and one thing and another on it. Yes, I expect it will do some good in the way of wetting up the lands. The water comes from the river, and I presume some of the water in the river does come from the rainfall. I don't know whether it has or has not come up to the present time from the melting of the snows in the mountains. I know the snows melt in the summer and spring, yes, sir, and the melting of the snow affects the river in the latter part of May. I know sometimes we had water in May.

Take it from the 25th of May, as a rule we had a rise in the river. That is, not very high, but it is like this: Whenever we go to cut alfalfa I always want to manage to get the alfalfa cut if possible before the 25th of May, because I think the river might rise from the melting snows in the mountains as early as the 25th of May, yes, sir. This is what is known as a cold, wet spring up to the last day or two, yes, sir.

7177 I raise alfalfa, kaffir corn, barley and wheat on my lands. As to the value of my land at the present time, I have been offered $25 an acre, and I refused that. I don't want to sell it. As to the market value of my land or of similar lands in this vicinity, there hasn't been much bottom land sold there. I know what the uplands sell for. The farming lands sell for $20 an acre. Yes, sir,

7178 I have refused $25 an acre for mine. That offer was made a year ago. Yes, sir, farming lands have increased in value considerably since that time. I guess they have. Yes, sir, my lands are more valuable today than they have been at any time since I purchased them. Considerably higher, yes, sir.

As to my considering this a favorable spot for settlers to locate at the present time (objection), I would think it would be, because lands are cheaper here than they are in the eastern part of the State, but as to whether they are cheaper now than they will be in the future, I can't answer that question. Nor can I tell whether they will enhance in value here in the next few years. (Objection.) As to what my judgment is in that regard, I will say, if we get it dry again for a few months they will go down. They go up and down here mighty quick. Yes, sir, I think they would be a fair investment at the present time.

Redirect examination.

7179 By Mr. ASHBAUGH:

As to whether my lands have been more or less valuable because of the falling of the water in the river, I will answer, well, so far as the crops are concerned they have not been any more valuable. I know we don't get the amount of hay we used to get. And so far as production is concerned, they are not as valuable.

7180 O. H. SIMPSON, Dodge City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived in Dodge City continuously since March, 1886. It has been about twenty years since I originally came here. I am a dentist. I have no lands at the present time, but I have owned lands in the Arkansas valley. I have owned upwards of 2,000 acres, about ten miles west of Dodge City, and there was about two miles

of river front on the south side. I owned those lands since
7181 1897, and I disposed of them two years ago. Yes, sir, I have been acquainted with the Arkansas valley and Arkansas river for the last twenty years. As to how the flow of the river, exclusive of floods, for the last ten years has compared with the flow of the river under the same conditions for the first ten years I knew it, I will answer, it has not been so great. As to the flow of the river during the fall of 1903 and spring of 1904, I will answer, well, there hasn't been—well, an abundance of water. In fact prior to this flood I don't regard that there has been any water at all. The present high water must have lasted six weeks or so.

The width of the valley at the place where I owned my lands is about three-quarters of a mile on the south side, and on the north side not over a quarter of a mile, in fact the river cuts against the bank part of the way. The depth to water on those lands that I owned on the south side would range from two to thirty feet. About 600 acres of that land was bottom land, and on that the average depth to water was about five feet. As to the influence of
7182 the river upon the water level under those bottom lands, I will answer, well, it rises and falls with the river. As to how far back that extends, I will say, as I am best able to judge, I believe it is back under the whole of the land I owned and controlled, and that would be about two miles back from the river. Yes, sir, when the river was up the water level was higher than when the river was low or dry. Yes, sir, I have known something about the fact of the water being appropriated in Colorado and used for irrigation purposes within the last fifteen years. As to whether the use of the water in Colorado during those years has made the flow of the river during the dry season of the year higher than it was before (objection), I will answer that it has not. As to the
7183 average flow of the river during the dry season of the year for the past twelve years prior to 1904 as compared with the twelve years prior to that, I will say I think it has been considerably less. As to whether the use of the water in the State of Colorado in the last twelve years has tended to equalize the flow of the river during the dry season, I will answer, not according to my observation. As to whether the water level is lower during the last ten years under the bottom lands than it was prior to that time, (objection), I will answer, according to my experience it is. As to whether the water level is affected to any considerable extent by the rains upon the uplands, I will say I don't think it is. As to what determines the level of the underflow beneath the bottom lands along the river, I will answer, the height of the water in the channel. Yes, sir, the channel of the river has narrowed through Ford county within the last fifteen or twenty
7184 years. I have not measured it, but I would venture that it is twenty-five per cent. narrower. Yes, sir, I know of made land along the Arkansas river—made by accretion. As to the bed of the river having changed within the last fifteen years, I would

say it has narrowed up. The islands that were pretty well toward the center are now a part of the main land. I know of several instances of that kind. As to whether there is a greater number of islands now in the river than there were twenty years ago, I rather think there is, and it is a fact that those islands are now grown over with trees that were not grown over twenty years ago. As to the carrying capacity of the river through Ford county today, with water at the same height as measured by the banks, compared with the carrying capacity twenty years ago, it is not so great. I attribute this to the fact that the bed has narrowed up, and I believe it is also due to the fact that the water has
7185 been taken out of the river, and also to the growth of trees and the formation of islands, etc. As to the cause of the narrowing of the river and the filling up of the islands as I have described it, I will answer, well, there is not the demand. Nature does not make the demand on it that it used to. There isn't the volume of water goes down that used to keep the banks washed out. As to the river filling up and the narrowing of the banks during the dry times for a number of weeks, I will say it permits young cottonwoods to grow that wouldn't grow if the water was covering the whole of the channel. As to sand drifting in there and becoming wet and remaining there (objection), I will say it is not
7186 my idea that sand drifts into the river. My *my* observavation is that—well, it will drift from the lower levels around the cottonwoods and grasses and such places as that, but according to my observation it drifts from the mainland into the river. As to whether the cottonwoods become more permanently rooted and located in the river after a series of dry times, I will answer, yes, sir, they do, because it made me about 80 acres or 75 acres of land that only overflows occasionally, that had cottonwoods on it about four or five feet high, and occasionally—well, if they were two feet high they would sometimes wash out, but those that got growth enough on them during that dry spell to attain a height of about four or five feet stayed there. As to the height of those cottonwoods on the islands, I will answer, they are about from four to twenty-five feet, I suppose, and that would indicate that they are from eighteen to twenty years old down.

Cross-examination.

By Mr. MILLER:

I located in Ford county in March, 1886. My occupation during the first years was dentistry. I don't remember just the
7187 dates that I owned the two miles of land mentioned, ten miles west of Dodge City, but it was between 1897 and 1902. I didn't own 2,000 acres, I controlled about that. I owned about 1,600 or 1,700 acres, as I remember.

Yes, sir, I stated that the condition of the water in the Arkansas river during the last ten years as compared with the ten years pre-

vious to 1895 showed a diminution in the last ten years. Yes, sir, there have been periods during each of the years in the last ten years when the river has been high for a period of time during the year, but during the previous ten years I think there were longer periods that it was high. No, sir, I don't know anything about the change of condition in the water shed about the head of the tributaries of the Arkansas river which would be calculated to shorten the period of high waters during the last ten years as compared with the
7188 previous years. I have frequently been in Colorado, but didn't go there with a view of familiarizing myself with those conditions. I am just fairly familiar with the use of the waters of the Arkansas river for irrigation west of here, especially about Garden City, Syracuse and west of Cimarron, just about as familiar as a person would be who goes through the country every year or two. Yes, sir, if it is true that they have revived those ditches in western Kansas and put them into operation and have applied the water there, that in itself would tend to reduce the water in this neighborhood. As to whether they have or have not during the last few years changed the use of the water in western Kansas and applied it to the irrigation of the lands, I would answer, nothing more than the natural growth. No, sir, I haven't
7189 investigated it and have no knowledge concerning it. Yes, sir, these things might be caused by conditions west of here just as well as by the use of the water for irrigation in Colorado. No, sir, I do not pretend to know what the changed condition in the water sheds at the sources of the Arkansas river and its tributaries has been during the last few years. I don't know whether the cutting off of the timbers and the general transformation of the surface of the ground there and its effect upon the retention of the waters in the spring of the year has been threatened by the influence of settlements and civilization or not. Yes, sir, if there is a shorter period of high water at Dodge City today it might be caused by other influences than this irrigation in Colorado, so far as I know personally.

Yes, sir, there were some islands in the river here when I
7190 came here in 1886. No, sir, I don't know when those were formed. No, sir, I don't know but what the same causes were operating and building islands previous to 1886 as were making additional ones after 1886. As to whether it is a fact from my general reading of scientific works relating to the waters of rivers, etc., that such rivers as the Mississippi, Rio Grande and Missouri in places have been raising their channels so that in places in those streams the channel of the river is higher than the surrounding country (objection), I would say I believe down on the Mississippi, at the mouth of the river, at the delta of the Mississippi, it is a fact that the channel is higher, due to deposits of earth. That is the only river I know of. I don't know whether that condition extends north of New Orleans or not, and I don't know anything about whether the same condition exists in the Rio Grande at

El Paso and on south, or whether the channel is rising so that the river is becoming higher than the surrounding country and it is necessary for the Government to interfere and protect the surrounding country from overflow.

7191 I think the flow of the Arkansas river down through this country is rather fast. As I understand it, it is about 7½ feet to the mile. Yes, sir, during the high waters it does carry a large amount of sediment, consisting largely of silt and sand; and that is the condition of it today, yes, sir, very riley and unfit for any use without settling it or in some way purifying it and cleaning it. And that is constantly making deposits along the river, yes, sir.

7192 I suppose this country has been settled up here through Ford county perhaps about thirty-five years. The river has not been fenced up that long. I suppose they began to fence the river along about twenty or twenty-five years ago. No, sir, there are no more cattle running at large here now that have access to the river than in former years. As to what is the tendency when large herds of cattle have access to the stream such as this Arkansas river through here with regard to the growth of brush and trees about the banks, I would say I don't suppose they would encourage it. The tendency would be to keep it down, yes, sir. And that is even true of pasture lands—if you turn a bunch of cattle in where there is a pretty heavy growth of trees and brush the tendency is to trample it out so that you can go through easy, yes, sir. Yes, sir, there used to be a large amount of buffaloes up and down this

7193 valley. Tradition says so. Tradition says that the herds went into the thousands, yes, sir, and they would come in large droves to the river. And all of those causes tend to retard the growth of the trees, yes, sir. I don't think that the present growth of trees and shrubbery throughout this country is beneficial to it in the way of tending to increase the humidity and the rainfall. Perhaps it would be beneficial to any arid country to have a large amount of trees or an increase in the amount of vegetation, but maybe it wouldn't be a drop in a bucket, a few trees along the Arkansas river, to influence or modify this climate. Yes, I think the tendency would be for the betterment of it. Yes, sir, I know something about the rainfall about Dodge City during the last ten years. I don't think according to the reports of the signal officer it has increased any. Yes, sir, we have a person here who takes measurements of the rainfall. He is the signal officer. The one here at present is a new man; he has only been here two or three weeks, and I don't remember his name.

Redirect examination.

By Mr. ASHBAUGH:

7194 As to it being a fact that the river has narrowed and that the islands have grown up and covered with trees somewhat since the time that the water in the river went down, I will answer, the growth of islands has been more marked in recent years and the

filling in of the river has been more marked in recent years also. Yes, sir, I think so.

Cross-examination.

By Mr. CAMPBELL:

There is considerable cultivated land in this county and west of here in Kansas, yes, sir. Oh, yes, there was some when I first came here, but it has largely increased since, and largely increased in Colorado also. This country—western Kansas and also Colorado along the Arkansas river—is subject to torrential storms, yes, sir. I have never given any thought to the question as to whether these torrential storms carry more sediment by reason of the land
7195 being cultivated that finds lodgment in the river than it did years ago. I know enough about cultivated lands to know that it is more easily dissolved by rainfall than the land that is under sod, yes, sir. Yes, sir, I know what the rainfall in this section of the country is. I suppose it approximates six or seven inches during the year. As to whether it is not more than that and around eighteen inches, I will say that I know in the year 1893 there was 1.53 inches of rainfall that fell in eight or nine months, but I don't know what the average rainfall has been during the last few years. Assuming that there are sixteen inches of rainfall in a year in this vicinity, it is all absorbed, I suppose, and goes into the Arkansas river. That which does not go into the Arkansas river finds its way through and sinks into the ground, yes, sir. What I
7196 meant by saying that the underflow or underground water did not receive any supply or was not supplemented by rainfall was that it don't seem to penetrate and go through this hard or dense soil down to it. It don't seem to get there. No, there isn't any hardpan under the surface here that prevents it from going down, and in any wells that I have ever dug or any cellars I found the ground always dry and hard so that it would not plow.

Q. So that in your judgment, then, of this sixteen inches of water that falls here in this vicinity throughout the year there is none of it reaches what you call this underground water or underflow?

A. There may be some of it, but I don't believe the bulk of it does.

Yes, sir, this rainfall is either evaporated or goes up in the air or finds its way to the Arkansas river. I am satisfied that this underflow extends back two miles, because I had a windmill at that distance. Yes, sir, they find water beyond the two mile limit from the river. As to where it comes from, I believe it connects with
7197 this underflow. If it is found on higher ground away back beyond the two mile limit, I would say I haven't investigated in a scientific way, yet I am satisfied it connects up with the other water. As to how far back it connects, I will say that on the south side of the river I imagine it is upwards of ten or fifteen miles. Yes, sir, there is underground water beyond that, and it comes

from Crooked creek and the other way. These are not dry creeks, not always.

Q. So then your theory is that any water that is found here in western Kansas comes from the creeks and none of it comes from rainfall? Do you want to be so understood?

A. Yes, sir.

7198 CHARLES H. NORTHROP, Dodge City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Ford county, Kansas, and at the present time I am under-sheriff of Ford county. I have been in various lines of business. For the past eleven or twelve years and up to within two years ago I was in the meat business in Dodge City for about eleven
7199 years. I have resided in Ford county almost continuously since 1878. Before that time I have been in Colorado at two different times. I expect I put in about two years in Colorado during that time. I first came to Ford county in 1877, but went home to Illinois where my people lived in the winter of 1877 and came back here in the spring of 1878 and have made it my home ever since. Yes, sir, my business now takes me all over the county, and while I was in the meat business I bought cattle in different locations all over the county. I have been under-sheriff about a year.

Yes, sir, I am somewhat familiar with the drainage in the north part of Ford county. When this Eureka irrigating canal was put in through here I worked for that company for a little over three years. The first year of my work for them I was with the engineers when we were locating and establishing lines, and after they commenced construction I took charge of an outfit in the construction department. I worked on the Eureka canal and the South
7200 Side canal something like four years. Yes, sir, I mean by the Eureka canal the Soule canal. That Soule canal taps the river at Ingalls, in Gray county, about six and a half miles west of Cimarron on the north side of the river, and it meanders down the river along on the bluffs until we get out here about ten miles west of Dodge, and then it runs back into the hills and from there it continues on down into Edwards county. The main canal was about 70 miles long and about 110 miles of laterals were put in. (Objection.) The canal was 48 feet wide on top and 30 feet on the
7201 bottom. (Objection.) It was 5 feet deep, and then a sub-grade of a foot and a half. It was 5 feet down to the bottom of these banks and then there was another grade in the bottom that went right down in a sub-grade 18 inches in the center. The grade of that canal is 2 feet per mile until we reach the top of the hills there. The canal is back north of Dodge City about two miles from here.

I don't know how high Dodge City is above the level of the Ar-

kansas river; that is, I don't know what point in Dodge City. I haven't the elevations. At a low stage of the water the Santa Fe track right in front of the passenger depot down here in Dodge City is sixteen feet above the level of the river, and at the city hall or the Government land office it is approximately about the
7202 same. As to how high the court house is, I will answer that I couldn't say. These elevations are very deceiving. I have worked with the instrument long enough to know that a man with the naked eye—his estimation don't amount to very much. In a rough guess I should say the court house here is perhaps 30 feet above the level of the river, and four or five blocks north of the court house it still rises. I have heard just what the elevation was out here at the stand-pipe or the highest point. I am of the impression it is something like 90 feet. That is my recollection. From that point the drainage slopes to the north—the country does. That ridge where the general drainage begins to go north is somewhere from a mile and a quarter to a mile and a half at this particular point, right across here; and that condition extends very
7203 largely both east and west from Dodge City. On an average all along the north side of the river from Cimarron to Ford, as to how far back it is from the river where this drainage goes north, I would say, it is from one to four miles, and I think that every point between those two places named would come within that limit. (Objection.) As to what streams rise near the Arkansas river and then make a part of this drainage to the north, beginning up the river as far as Cimarron, I will say, we have the Pawnee, the Buckner, the Sawlog, Duck creek and Coon creek. Coon creek extends on down as far as Edwards county. Yes, sir, Pawnee creek is a part of the Pawnee river that enters the Arkansas river at Larned. To the best of my knowledge it rises and the drainage begins to run to the north something like eight or nine miles from the Arkansas river, at the head of the Pawnee. The Pawnee rises north and some west of Cimarron. There
7204 are little branches that run into the Pawnee near Cimarron, and then there is the Buckner that is between the Pawnee and the Arkansas river right directly north from Cimarron, and the Buckner receives water within two or three miles of the Arkansas river and then runs northeast. Coming down the Arkansas river from the Buckner, we next have the Sawlog and Duck creek. The main springs where the water flows continuously into Duck creek are about five miles right north from Dodge. Well, one mile west from Dodge and north. The waters just north from the stand-pipe in Dodge City run into Duck creek. Duck creek is similar to all the other western Kansas streams. It is deep banks and is a deep, narrow stream, and is fed by springs, and from the main spring at the head of it where it starts we have running water continuously. For about five miles we have running water there continu-
7205 ously the year round, but from there on down to the mouth of it there are four or five miles it goes dry in dry seasons. It is ordinarily dry.

These springs I speak of are five or six miles from the Arkansas river and on down. Well, there are springs clear on down the creek, in the hills back from the creek, a good many of them. For the first five miles here on Duck creek the springs are all on the south side and next to the hills and the general slope is north and northeast, and then the creek takes a bend and runs almost directly north. Where that creek bends and runs north then the springs are all on the west side of the creek from there on. Duck creek finally enters into the Sawlog. Yes, there are other sources of the Sawlog that rise near the Arkansas river. This country is drained by big draws and ravines that run into it. There is one out
7206 here we call the Five-mile and another one we call the Eight-mile. Of course they are not running streams, only in rains and like that, but of course they drain all this country between here and Spearville. That runs to the Sawlog, that is, everything north of the railroad, and between the railroad and the river is this Coon creek that empties into the Arkansas river down near Garfield, below Kinsley. Coon creek rises something like four or five miles directly east of the soldiers' home at Fort Dodge, and the soldiers' home is five miles east of here. It may be a little northeast. The drainage for a short distance around the source of Coon creek is to the northeast. Yes, the drainage of the country for some distance around there is to the northeast. There is quite a large valley in some places there that slopes in all directions down to this creek, and the main direction of the creek is northeast and away from the Arkansas river. There is quite a big bend in the river down below here near Ford, then the river runs to the southeast, more south than east, there, for several miles, and this Coon creek seems to run in about the same direction as the river bends around there and keeps about the same distance
7207 from the river for quite a ways there. As to how near to the Arkansas river this drainage extends that turns the water into Coon creek, I will say it varies. There is one particular place down there I think right in south of Spearville it is probably four miles or something like that that the drainage is toward the Arkansas river, but at other points the drainage is toward Coon creek, and in some places I think this drainage is within a mile or a mile and a half or two miles, in other places four miles, from the river. Yes, the drainage from Cimarron to Ford that turns the water into the Arkansas river is very narrow along here, and would run, as I said, from a mile and a half to four miles. It would probably average two or two and a half miles. Yes, sir, and then north of that the whole drainage is to the north and east into these creeks I have described. That is, I am speaking now of the north side of the river. Yes, sir, Duck creek was up very high a
7208 week or so ago and a serious accident occurred there last Sunday when four persons were drowned.

The Government station here recorded 1.56 inches of rainfall in a few minutes here Sunday morning. They claim it raised the

creek eight or ten feet. The creek is narrow and has high banks, and when it rises it gets pretty high. Yes, water always flows in Coon creek up toward its head. It is there a perennial stream. As to how many of these streams I have described are perennial, at least toward their heads, I will answer, Duck creek, about half the length of it, that is, the upper half, flows continuously the year round, and the Pawnee does. The Sawlog goes dry in dry seasons, and the upper half of the Buckner goes dry at different seasons. Some parts of the Buckner are perennial, yet, sir, the lower part, but the upper part goes dry. I think about half of the length of Coon creek flows continuously.

7209 I don't think the Arkansas valley between Cimarron and Ford on an average on the north side of the river back simply to the uplands is more than half a mile wide. That would be somewhere near it. On the south side of the river between the same places there is not much difference in width. In some places it is very narrow and in some places it widens.

Yes, sir, I have been familiar with the flow of the Arkansas river from 1878 to the present time. I have worked along the river the greater portion of the time, and in the early days I herded cattle in this country. I herded down in the vicinity of Ford and on the north side of the river where I worked mostly, and we watered at the river.

As to the flow of the river for the last ten years prior to 1904 during the dry season, excluding floods, as compared with the average flow for the first ten years I knew it (objection), when

7210 I first came to this country there was generally a good flow of water in the river. In crossing the river I know we used to have difficulty in getting in and out. Of course we were used to crossing the river in those days and didn't think much about it. Where we could find a place we could get down into the bank we went off in and went and looked for a place to crawl out. That was the worst in crossing the river, in getting in and out, but it was nothing uncommon for us in riding across the river to get into a hole and swim a horse during the summer season here. But there was a good deal of water in the river in those days. During the dry season of the year it was not so high. There were times when the river was pretty low even in those days, but ordinarily we had a good flow of water. As to the average during the last ten years prior to 1904 (objection), I would say that we had a good deal more water in those early days. As to

7211 what changes have taken place along the river as far up as I knew it and down as far as Ford in respect to the banks, I will say, oh, there have been a good many changes along the river. The channel has changed. I know of some instances where the channel has changed from one side of an island, perhaps, to another, and the banks have narrowed. In a good many places where there has been a channel between the island and the mainland, that has filled up and grown up with trees in the last few years, and

of course that has narrowed up the channel a good deal. Yes, sir, I should say that the banks have narrowed as a whole between Cimarron and Ford. As to there being made land along the river, I will say, yes, sir, that extends almost continuously up and down the river. As to whether there are more islands now than there were when I first knew the river, I will say I think there are. Some of them are a good deal larger than they were, and there is timber growing on them now. I couldn't say exactly when it began to grow.

7212 When I first commenced to work on the river there was at the mouth of Mulberry creek down here right near Ford on the south side of the river eleven trees there at that time, good size cottonwoods, and opposite the old fort down there, just a little west and opposite, was a big cottonwood, and there were three big cottonwood trees right down here near the end of the bridge, and then above here at what they call Chipman's grove there was quite a number of trees up there at that time. But that was all the trees there were on the Arkansas river back in 1878, and this grove that we see here now has grown up, I think it is safe to say, within the past twenty years and under. Yes, sir, most of it has grown up within the last twelve years. The main part of it has grown up within the last twelve or fifteen years.

7213 As to what effect the lowering of the water in the river has had upon the underflow (objection), I will say, well, this what we call the underflow varies with the water in the river. Now, as an illustration: When I was working with the ditch company I had charge of the construction department, on the south side. When we were going to put in a well at one point we got the engineer to take the levels. After we got the elevation above the water in the river we could tell just exactly or within six or seven inches or a foot how far it was to water, because we struck the water just on a level with the river. (Objection). As to how far back from the river that extended, I will answer, well, of course that was on the bottom. Of course we didn't get off the bottom in our work on that construction. We were on the bottom altogether. As to how far back that condition extended I will say, I think probably three-quarters of a mile is as far as we got back. Yes, sir, when we dug those wells we found water

7214 on a level with the water in the river. Now, sir, it didn't make any difference whether the water in the river was high or low, we found it just on a level with the water wherever the water was, high or low. Yes, sir, if the water in the river was higher we found that water back three-quarters of a mile higher than though the river was lower. Yes, sir, the water varied back three-quarters of a mile as the water varied in the river. As to how far back from actual observation the river has an influence upon the level of the underflow, I will say we didn't get more than three-quarters of a mile back from the river. That is as far as I could state from my own personal knowledge, and from that observation it did have an

influence three-quarters of a mile back. That was all along up and down wherever we worked and not at any particular point.

What I know about the artesian wells south of here, as to whether they are affected by the condition of the river, is only from hearsay.

(Objection.) The people that live down in that country
7215 and own those wells claim that they can tell whenever they have a rise in the river, because their wells flow slower (motion)—— As to what effect the rise in the river has upon the underflow up and down the river above and below Dodge City (objection), I can't say that I know of my own personal knowledge any more than through Ford county. Yes, sir, it does extend through Ford county, and it does produce that condition down here at the soldiers' home. At the soldiers' home there is in the neighborhood of 450 or 500 acres of land and probably half of it is bottom land.

7216 No, sir, I think the flow of the river during the dry seasons of the year prior to 1904 has not increased during the dry seasons in the last ten or twelve years. The flow of the river during the dry seasons of the year for the past ten or twelve years through Ford county has been lower for a longer period, and what I mean by that is the river has been extremely low for a good many months at a time in the past ten or twelve years. It has been almost dry here for months when years ago it was very seldom that we had extremely low water. As to how long these extremely low water periods lasted in the early years, I will say I don't remember ever having but two during all of those years, and one was in—well, I don't remember just what time, but in the spring it
7217 was. And then it was for I should think probably six weeks or two months, and then we got what we called our June rise and freshets, and after that we had plenty of water right along continuously for several years. My recollection is that during the whole of the fall of 1903 and the winter of 1903–'4 and the spring of 1904 down to the first week in May the river was very low. There was no running water. There may have been some standing water in holes and places, but there was running water a great deal of that time.

As to what effect it would have upon the bottom lands along the Arkansas river in Ford county if the flood waters could be stored and used above here, as to decreasing the amount of flood water and increasing the amount of flow during the dry season of the year, I will answer, our bottom land here is certainly more productive at seasons when we have more water in the river. It makes a great difference with our hay crop and all other crops growing on the river here when there is water in the river for any considerable length of time during the summer. I think it would have a beneficial effect upon the bottom lands through Ford county to have the flood waters decreased and the flow during the dry seasons of the year increased. And that would extend to all the bottom lands in Ford county.

7218 As to the carrying capacity of the river through Ford county compared with the carrying capacity of the river as it was the first years I knew it, the waters being reckoned at the same height as judged by the banks, I will say I think it is much less at the present time, and as to why I say that, it is because a good many of these old channels have filled up—grown up with trees and bushes. The channel is narrower than it used to be, and that extends practically through Ford county, and that condition can be seen between Dodge City and Cimarron from the Santa Fe trains.

Cross-examination.

By Mr. MILLER:

As to what, in my estimation, has caused the growth of trees and vegetation along the river, I think these trees came up there voluntarily. I suppose the seeds wash down the river and they grow on the sand bars and islands and spring up here. When the
7219 water is low for any considerable length of time they take root and grow there permanently, but if the water rises up while they are small it washes them out and does away with them. Yes, sir, the river was pretty high during the summer of 1904, but not very long. No, sir, I don't think it is true that we had one of the greatest floods last year that we have had in forty years. I think not. No, sir, I didn't take measurements of these different floods myself. The water has been higher this year—I know of places where it has got out over the banks all over the bottoms this year where it hadn't been out before for a good many years. No, sir, I took no measurements. This is only just from observation where I see it gets out over the banks and along the bottoms. As to whether I would prefer my own opinion to actual measure-
7220 ments by persons who have been doing that work along the streams for the last two years (objection), I would say no, sir. Yes, sir, it is a fact that the stream is protected on both sides by settlements and farms and fences. It is pretty well settled up. Years ago it used to be all grazing land up and down here—large herds of cattle—and they had access to the stream wherever they could find a place to get to the water, yes, sir, and I think it would be the tendency of those herds to keep the shrubbery beaten down. But there was nothing of the kind. There was no shrubbery nor trees nor bushes, and there was no indication that there ever had been any at that time. As to whether it has grown steadily since the settlements began, and as to what is the age of these cottonwoods along this river that we see now, I would say there isn't anything,
7221 unless there has been some planted. Now, in what we call the park here those trees have been set out, and as to the voluntary growths along the river banks and islands, there is nothing between here and the mouth of the Mulberry with the exception of one tree that is more than twenty years old. As to whether that

was about the time when settlements began here and the land commenced to be cultivated, I will say, the settlements date back to 1878. Nearly all this Government land was taken up here in 1877 and 1878. As to when they commenced farming it and breaking the soil and putting in seed, I will say, they had to establish a residence. Well, there was a good deal of farming done in 1878, and the first fencing I know of along the bank of the river here was in 1882. Yes, sir, it is a fact that the land on either side of the river here is fenced up at the present time, nearly
7222 all the way down. Yes, sir, most of the land is farmed in some manner or other—either hay land or seeded into some grain crop at the present time, most of it. Some of it is in pasture, of course. As to how long this entire bank has been fenced up, it is only within the last few years that it has all been fenced. It was gradually taking place previous to that, yes, sir. There are no big herds of cattle here now and there haven't been any large herds here I think for about two years. I think that Dodge City ceased to be a great shipping point for cattle out here about 1885 and along about those years we had a drouth here and
7223 nearly all the people in the country left, and when it revived again it revived under new conditions which were supported by the local industries about Dodge City, yes, sir. Well, I will have to answer that in this way. After they moved the trail, as we called it, here—the main trail used to run to Dodge from the south and from here to Ogallala, Nebraska, and this was a great shipping point at that time. They drove cattle from the south here and then from here we shipped a great many of them over the road here, and they went up north up into the Territories, and a great many were driven across the country. My recollection is that it was about 1885 that they moved the trail west to the Colorado line. They moved it about to the State line and established the town of Trail City, just the other side of Coolidge, right on the trail. Yes, sir, and since that time the general conditions of Dodge City here have been changed. Yes, there have been different kinds of business, and the general character of the country around here and the people have been changed since that time, and along about those years most of our citizens left this country and the country was then filled up with stock and then became quite a stock country, but the stock was owned by local people—by the residents of this country. Up to that time the cattle in this country were cattle that
7224 were driven in here and held on the market for sale, but since that time this country began to settle up and they commenced to fence the country in big pastures and our people right here went into the stock business and this has been quite a big stock country up to the last two years, when stock went down so that they were not worth anything and most of the people went out of the business. A bunch of 200 head of cattle here now is quite a bunch at the present time. As to what use this country about Dodge City north and south outside of the valley is put to, I would

say there is a great deal of it used for grazing, but there has been more farming down here in the last two years than ever before. Yes, sir, they have been gradually taking what we call the uplands, which lie beyond the valley, and have been fencing and putting it under cultivation. There is a great deal of prairie land broken up this last year and the country is gradually filling up back from the river on each side, yes, sir.

7225 As to whether this ground water or water that lies under the surface here in the valley extends back through the hills, I would answer, no, sir, I couldn't say how far. You can get water back on any of these hills by going deep enough, yes, sir, but I have never had any experience two miles back from the river on the south side. I never dug any wells there, but all of the farmers there have wells from which they get water for their stock, yes, sir. No, I know of no persons who have been unable to find this water south of here. Yes, sir, and this same thing is true north. What we call the first water, north of here, is about on a level, but when we come to the second water, that varies in depth. In some places we have to go deeper for it than in others. Yes, sir, the water does extend through these hills to the south and north, and when they strike water in wells they strike large bodies and there is a good flow of it. It is very seldom that you hear of a well failing in this country, and in a good many places that furnishes the water for domestic stock too, yes, sir.

7226 No, sir, there has been no irrigation on any of these hills or uplands. I think irrigation would be beneficial to this country about Dodge City, yes, sir.

As to the general values of valley lands here around Dodge City, in the valley they are holding lands here at $25 to $100 an acre. The chief crops that are grown on the valley lands here are alfalfa and wild hay. As to how the values of the lands I have mentioned compare with the values of lands previous to 1894, I think you could have bought this same land in about 1894 at from $10 to $50 an acre. No, sir, this is not known as a corn country about Dodge City. I think the corn country begins about fifty miles east of here at about Stafford or St. John. That is quite a corn country down there.

As to what particular cause I think makes the change in the river being lower for longer periods in recent years than it used to be during the periods of ten years ago and more, my idea is that

7227 the water above here is taken out of the river. Yes, sir, I have made investigations that convinced me as to the true cause of this change. I lived in La Junta seventeen months, and the people were doing considerable kicking around there among themselves because in one locality they accused some other locality just above them of taking the water away from them just at the time they needed it, and I know that is the condition up in that country, and that is where they use the water. I resided there continuously for seventeen months, so that I was there the year round,

and this kicking was during the season when they needed water, yes, sir, in the summer time, in growing their crops.

Yes, sir, we have certain periods during each year now and for the last ten years when the river does rise here in Kansas, and I mean to say that that period is of shorter duration now than it used to be years previous, yes, sir. I couldn't say whether or not it is true that the same condition exists in the rivers in Colorado in the mountains and as they emerge from the mountains or that
7228 the period of rise there is of less duration than it used to be in years previous. As to whether it is not a fact that the settlement of Colorado and the industries that have been going on there have resulted in the transformation of the head of the Arkansas river itself so that the forests have been taken off and the power of the ground to retain water has diminished and therefore in the spring of the year those snows have been wiped out quicker and the rise of the river lasts for a shorter period than it did in years past, and I would say I am not at all posted as to the conditions up in that country and I don't know whether the same condition is not true in Colorado, even in the mountain streams, as I have described here in Kansas. Yes, sir, it is true that in the last twenty years we have been fencing in these lands not only in the valley but gradually have been taking in lands back on the hills until a large extent of the farming area has been improved. We have broken up the ground and put it into seed, etc., yes, sir, and I think probably as much of this water
7229 from the rainfall does go into the river now as ever did. (Objection.) Yes, sir, the breaking up of the surface and the tilling of the soil tends to increase its power to absorb the water when it rains. It would hold more moisture. The absorption would be greater and the evaporation, I expect, would be greater. As to whether as you go out on to these grazing lands west of here where the surface is pretty well pastured down and the soil is hard from the cattle tramping over it and it is not tilled the water runs off very quickly and there is not very much of it absorbed by the land, I would say, oh, yes, there is a good deal of the water absorbed. Right at the present time this ground is wet down three and a half feet. Oh, yes, there is a good deal of water absorbed. As to whether or not the absorbing power is not greater than if the soil is not broken, I would say I think it is.

7230 As to what kind of crops are growing on these uplands that I say are now under cultivation, I would say wheat principally, and then they raise forage crops.

The value of these lands runs from $5 to $10 an acre, and when it was used for pasture or grazing lands for herds there were several years here it didn't seem to have much value. It was held at about Government prices. As to whether about Dodge City at the present time there is a feeling of confidence in this country which is leading a good many people to come in here, and as to whether we are selling a good many lands at the present time to new settlers (objection),

I would say it is very evident that some of these new-comers here have confidence in it, the way they are buying. Yes, sir, and we folks are selling it to these new-comers at the prices I have mentioned.

So far as I am concerned, I have no confidence in this as a farm-
7231 ing country. I have been here for so many years and have seen so many failures that I am of the opinion that we are liable to have a failure here at any time, unless we get irrigation or something of that kind. Yes, I think irrigation would make it steady. If we had water we could use at any time we wanted to it would be a great thing; and this irrigation country extends east for several miles. Yes, Coon creek, Buckner creek and Pawnee river are all tributaries of the Arkansas river east of here. No, sir, I don't know what feeds those springs along these creeks, but the supposition is that it is water from the Arkansas river. Yes, sir, the water shed of the Arkansas river really extends north of these rivers I have mentioned. Yes, sir, the rise in the waters east of here is largely caused by the rise in these rivers which I have mentioned. At times they become torrents and cause a great rise in the river east of here that causes a stoppage in the operation of the drainage somewhat and wipes out bridges here and east of here. It is very seldom
7232 we have any floods east of here. Our floods and washouts are mostly west. Yes, we had some floods east of here last June. Now that you mention it, I think that was caused by Cow creek washing out. Yes, sir, these rivers themselves become large and make feeders for the Arkansas river at times, causing it to rise and fall as they rise and fall. Yes, we have the Mulberry creek south of the Arkansas river here. I notice the Mulberry and I notice some others on this map I am referring to that have no names to them. There is one between here and the Mulberry that we call the Five-Mile. It is a dry stream, though, and there is no water running in it except just after a rain or something of that kind. Yes, sir, the Mulberry comes in about fourth and this other comes in just a little west of the soldiers' home.

7233 As to how far south of the Arkansas river the drainage goes into the Cimarron, I would say it must be about fourteen miles south of here where the water runs the other way and then it runs to Crooked creek southwest of here and Crooked creek goes into the Cimarron. As to whether the source of those springs along the banks of Coon creek, Buckner creek and Pawnee creek get their source from the ground water of the Arkansas river, I would say what leads me to believe it is toward the Arkansas river is because these—we will take for illustration Duck creek here. Those springs at the head of Duck creek are lower than the river right directly opposite here and in dry times when there is no water in the river here those springs get very weak and sometimes dry up and when we have plenty of water in the river those springs flow very freely. No,
7234 sir, we don't always have plenty of water in the river when the general conditions of the country show plenty of water. Not always. As to whether we have plenty of water in the river to-

day because we have a large amount of rainfall all over this country, I would answer (objection), of course this is only just a supposition with me, but the supposition with me is that west of here they have gotten plenty of water and are not using water out of the river for irrigating purposes at present. It is all coming down the river. Yes, sir, that is mere supposition on my part. As to whether if my supposition is wrong my conclusion is wrong (objection), I will say I don't know, sir. I don't claim to know why. As to whether I know when the irrigation season begins in Colorado, they use water there more or less all the summer season, but I couldn't say at what season it begins strongly to be used. I couldn't say just
7235 when it does begin. Yes, sir, it is true that as far north as you go along the Arkansas river you find this underground water; that is, you sink wells and you find a flow of water underground. As to whether there is a general drainage that comes in from the north that supplies what we call the underground water fourteen or fifteen miles north of here and on farther north, I will answer, not from the north, I don't think. The springs indicate that all this water that extends indefinitely from the north here comes from the Arkansas river, for the springs are all on the south side or the west side of these creeks and you cannot find any springs on the north side or northeast side of any of these creeks. There is a ridge between the river and all these creeks. Yes, sir, you will find this sheet of water extending north here indefinitely. They find it by digging down. No, sir, I will not say positively that when you find this sheet of water twenty-five miles north of here the general flow is not toward the river instead of
7236 away from the river. I never dug any wells over in that country, and I am just saying that judging from the location of the springs in the country. I am quite familiar with this country clear over to the Pawnee. I have herded cattle and horses and sheep all over this country and I don't know of any place in the country that they can't get water by digging. No, sir, the general drainage of this country from the north and the slope of the ground and the rock, etc., does not tend to drain the entire country from the north toward the river. It drains south and east. On the north side of the river here the formation of that rock—in some places it has just turned right up on edge. That is true over part of the country, yes, sir. But the general slope of the country is to the south and east. As to whether it is the theory of some
7237 persons who have dug wells here and have had experience in it that there is a large drainage from the Rocky mountains on to the southeast, I would say no, sir, I never heard anybody claim that. As to whether I would admit that as far north and northeast as one can sink and find this water every farmer has found it that has attempted to find it, I would say, yes, sir. I have never known of anybody not finding water if they went deep enough.

I have never known of but one instance where islands have

sprung up that farmers have put in dams and obstructions so as to catch the sediment and debris for the purpose of taking the island onto the mainland and making a permanent connection between the island and the bank. That was right here in town. R. M. Wright at one time put in some sand sacks and stopped the flow of the water around an island, and this man across the river—they throwed the channel across the river onto Mr. Crawford and he commenced suit against them at once and made Mr. Wright take the sand sacks out and served an injunction on him and made him clear it out. But that is the only instance I ever knew of. Yes, sir, we have some reclaimed land between here and the bridge west or south of us, but that has not been done by the interference of
7238 the people. It was caused from just natural causes. As to whether we have planted trees there and have been hauling stuff and dumping it there and whether we are not today hauling stuff and dumping it there, I would say, that is only just recently, since the city bought that land. It was something like fifteen years ago when Mr. Wright put those trees in there. Just guessing at it, I should think he probably put in twenty-five acres of trees. Yes, sir, a part of that used to be where the river flowed, and of late years it has ceased entirely to flow there and it is now used for a park. Yes, sir, and today they are hauling stuff and dumping it there, but not at the upper end where the old channel used to run in. Yes, sir, that dam that I spoke of was taken out. Not entirely. He just filled—he took gunny sacks and filled them with sand and built a dam right up there with them. I don't know how long
7239 they were left there. They might have been there thirty days or something like that, because I know they commenced proceedings against them at once. No, sir, I don't know how long after the proceedings were commenced before the hearing took place, exactly. As to it being some months before they were removed, I don't think it was. What makes me think he took them out pretty quick, this man commenced suit against him and sued him for damages and he opened up the channel on this side as quick as he could and he went over then and drove piling and planked that up. He turned the channel across there and drove a row of piling over there next to Mr. Crawford's land and planked that all up there and banked that up with sand to keep the channel from cutting in on him, to save a damage suit. No, sir, not to my knowledge has that thing been done elsewhere along the river; but it may have occurred
7240 and I not know it, yes, sir. As to whether the people are glad to have the stability of this channel fixed and not have it changing like it was in former years, I will say, I don't know as to that. I don't know as that makes any particular difference. As to whether if I owned a piece of land along the bank of the river I would want it changing its channel from year to year, I would say, I did own a piece of land just west of the State land, but it never affected me one way or the other whichever way the channel went.

That was hay land and alfalfa land. I had something like ten acres of made land there between the land I had on deed and the river, but it never got over to me. It never affected me in any way. But I think in some localities it might be advantageous to the farmers to have a fixed and stable channel, yes, sir.

Yes, sir, I presume that the growth of these trees along the banks of the river and other places along the river which tend to fix the soil more permanently is a benefit rather than a disadvantage. I presume it is in some places.

Redirect examination.

By Mr. ASHBAUGH:

7241 The narrowing of the river and the building of these islands seems to be natural, not artificial. This instance of Mr. Wright's is the only one I ever knew of in this whole country where any artificial means were employed. Yes, sir, I owned a piece of land down by the soldier's home just directly west of the State lands four and a half miles below Dodge City, and it ran down to the river. The west line of the Government land is about 150 feet, I should say, from the river bank. I couldn't say where
7242 it was in respect to the river bank years ago. I have only known of that particular corner for the last ten or twelve years. For the last ten or twelve years there has been no great difference in the location of that bank, but on the east line it is something like I should say probably 400 feet and maybe more at the present time, but ten or twelve years ago it was not more than half of that distance from the river. It has made out there I should think 150 feet in the last ten or twelve years and all grown up in cottonwoods. No, I didn't do anything to assist that. That is just by natural means. I just used it for a pasture, and the trees grew up in spite of the cattle there. Yes, that same condition is also true of other lands along the river there.

The general drainage of the country north and east from Dodge City two or three or four miles from the Arkansas river is to the northeast, and if counsel on cross examination got me to say that it was to the southeast, he was asking me about the stone—
7243 about how they lay. Yes, sir, the general drainage of the country north of a line two or three miles from the Arkansas river is to the north and east. (Objection.) As to those springs at Duck creek north from the Arkansas river, yes, sir, they are lower than the bed of the Arkansas river at a point immediately south of them. As to whether that is true of all those springs that drain into the streams that flow into the Pawnee, I couldn't say. It is true of all that I know about, and all these springs are on the south and west side of those streams. Where the streams run east the springs are on the south side of them, and where the streams run north they are on the west side of them, yes, sir.

7244 We didn't know anything about the flood at Hutchinson last year; it was something local there.

As to the South Side ditch that I spoke of, and as to its location, they took out a reservoir about seven miles west of here. That was what was known in those days as the underflow ditch, and it extended on down the river bottom to about eight miles east of Dodge. As to how long the ditch was, I will say, well, as it meandered around and followed the hills around here it was about twenty-one miles long. No, sir, that ditch was not originally connected with the river at all. It was purely an underflow ditch.

Another thing that convinced me that the water in the river affects this water away from the river (objection)—we scraped
7245 out a reservoir up there or started it with teams and scrapers and worked down to the water. About 70 feet wide and 1,500 feet long. We went down just as deep as we could, down to the water, as long as we could work in it, until we began to strike fine sand and quicksand and got into that water so that we couldn't work to an advantage and went down into the water so that the water stood all over this piece of land there, and while we were waiting for the dredging machines to come here and take that sand out the water went down in the river and left that all dry and we went in there then and took out about a foot more of that sand with scrapers. When the water fell in the river the water fell right in that place we had excavated there. This was five or six or seven hundred feet, probably, back from the river. It was not influenced by rains, no, sir.

Yes, sir, I spoke about those springs over here flowing stronger when the river is full, and that is exclusive of any rains that are on the uplands, and I spoke about those springs failing and
7246 having less force when the river went down, and that is also exclusive of any rain conditions, yes, sir. Our local rains don't seem to have much effect on those springs one way or the other, but the condition of the river does have an effect upon them, yes, sir.

Recross-examination.

By Mr. MILLER:

As to how far one would go north before striking the divide between the surface drainage which goes into the Arkansas river and the surface drainage which goes into the Pawnee and these other streams, I would say, right directly north from this point it is about a mile and a quarter, but as to the elevation of that divide I couldn't say. I should think probably 100 to 110 feet. When I speak of the drainage there being to the north I am referring to the surface drainage, yes, sir. When I spoke of a southeasterly drainage in answer to your question concerning the sub-strata of rock underneath, I was speaking about the rock drainage, yes, sir,

and my answer referred to that, and the one now refers to the surface drainage.

Yes, sir, I spoke about a reservoir we were digging in which
7247 we had reached water and presently the water disappeared and it was necessary to take out more sand in order to find the water. That was located up here about seven miles up the the river on the south side on Mr. Giles' place. There was about three weeks' time elapsed between the time we struck the water first and the time we found the water had subsided. As to that being a dry period, I couldn't say as to that. I don't remember. But I do remember that the volume of the water in the river subsided. That place was about five or six or seven hundred feet back from the river. Yes, sir, we chose rather a low spot on which to construct the reservoir, and the purpose of this reservoir was to furnish
7248 water for this canal. We went something like seven or eight feet below water; that is, after we got the dredging machines there and dredged it out.

Redirect examination.

By Mr. ASHBAUGH:

Yes, sir, I said this place where the reservoir was was five or six or seven hundred feet back from the river. There isn't any rock here at Dodge City. This rock—we were clear over here toward Buckner and Pawnee creeks at the time counsel asked me that question, and the rocks that I referred to were clear across over there on the Buckner and Pawnee. We have no stone over in this immediate locality right here until you get out several miles over in the Duck Creek country.

7250 S. H. THOMAS, Dodge City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live at the present time in Fort Dodge, Kansas, and am commandant of the Kansas State soldiers' home located at Fort Dodge in Ford county. It is about five miles east of Dodge City, and is owned by the State of Kansas. There are about 560 acres there owned by the State. Some of it has been recently purchased. That was upland—grazing land. Of the lands belonging to the State there something over 100 acres are bottom lands. As to what influence the flow of the river has upon these bottom lands (objection), I will say
7251 the flow of the river affects these bottom lands owned by the State of Kansas to a certain extent. As to what effect it has, I will answer, now, not this last spring but in other years we have a little more than six acres of meadow land right adjoining the river on the north side. The hay crop is not as good there as it used to

be, because it doesn't have the moisture, because the water is not in the river as plentifully as it used to be. As to whether the average flow of the river, exclusive of floods, for the last five or ten years is less than it used to be, (objection), I will say that since my knowledge of it along about in the beginning of 1895 it is less, except in seasons where there are other causes that bring up freshets, but in the regular season it is not so great. As to whether the lowering
7252 of the water in the river affected those State lands beneficially or injuriously (objection), I will answer that by stating that we put wells down for water purposes there in the home in 1894 and 1895, and about a year or such a matter after that we drilled deeper to catch up with the flow of the water. The level of the water beneath had gone down and we were compelled to dig these wells deeper for that reason, yes, sir.

As to what change has taken place along the State lands owned by the State of Kansas in respect to the banks of the river and the channel, I will answer, the only change I see is this—there has a net-work of islands been formed along that channel along the home lands to such an extent that when a freshet comes the main channel of the river has been disturbed by reason of these islands growing up in there. It is a regular net work of islands. It has thrown that current very heavily against the home lands. There
7253 were some of those islands there in 1895 when I went there, but there are a number of others that have sprung up since that time. As to what caused the growing of those islands, I will answer, it has been the absence of water—no flow. It has been so that we could walk across there in some seasons for the entire season without getting our feet wet.

As to how the flow of the river was during the fall of 1903, the winter of 1903–4 and the spring of 1904 down to May, I can't answer that. As to the carrying capacity of the river past the State lands now as compared with what it was when I first knew it, I will answer, it is more obstructed, and obstructed quite a good bit.

Cross-examination.

By Mr. DAWSON:

I have been commandant of the fort near Dodge City since about the 7th day of March, 1900. I was adjutant of that home a few years before that, up to about March, 1895. No, sir, I hadn't been there prior to that period of two years. My home *home*
7254 prior to that was at Ellsworth, Kansas, and I was not particularly acquainted with the Arkansas river before that year. I have been along it. Yes, sir, since 1900 I have really been in charge there. There are something over 600 people at the soldiers' home at the present time. The direction and charge of the farming lands there is under my control. As to what system, if any, I have of keeping track of the productiveness of the lands and the success with which the property of the State is

handled, I would answer, our bottom lands are in hay, you might say—alfalfa and prairie hay. There is land there that we have never disturbed, about 60 acres perhaps or more of prairie hay land, and then the balance or the greater part of the bottom land is in alfalfa. The way we keep track of the success with which the farm is managed, we very readily do that by the production of "roughness" that we get one year after another, and I make a report annually to the governor of all the proceedings of the home, yes, sir. In that annual report we set forth
7255 the amount of the products that have been raised upon the lands of the State at the home, and we also show the amount produced, the amount that has been sold and what we received for it, etc., yes, sir. As to how the lands have produced say for the last five years as compared with their production under my predecessors, I will say in speaking of wild hay land we had a better crop of wild hay along in the years 1895, 1896 and the spring of 1897—we had better crops than we have now since the years 1901, 1902 and 1903, and I would state this, that there are years—now, this spring we may have a better crop than we maybe had three or four years ago, because we have a greater abundance of rainfall. We have had seasons when we had light rainfall and we had a much less production than when we had a good rainfall; and it is considerably deeper to the underflow water than it was in 1895. As to
7256 how the productiveness of the lands at the soldiers' home have compared since I have been commandant there, according to the reports, with what they were for the five years before I took change, I will say we have a fair turnout or productiveness, I might say, of garden vegetables now because we have resorted to irrigation. We have had good vegetables without that, but of late years we have had to go to the irrigating scheme, and on the hay land more particularly we don't have as good a hay crop as we used to. Now, I don't want to be stating that this takes place every year. I have seen years when there was but little rainfall, back in 1895, when they would have a fine turnout of hay. I have seen seasons where this same hay land wouldn't give as good a turnout of hay.

As to how far we go to water on these bottom lands, I would say we could take the auger stem and drill to water in 1895 at twelve to fourteen feet. We go down now to something like twenty or thirty feet to get into a good strong water flow. But as to where we strike the surface flow on the bottom now, I haven't tested that for a number of years. Oh, yes, I did about two years ago. About 1895 we struck it at about fourteen feet. I couldn't say just how high these lands are above the river. They lie right close along the river, and the banks are not over six or eight feet above the bed of the stream. As to how far it is as the river is running now from the banks at the soldiers' home down to the level of the
7257 water, I would say there is quite a head of water in the stream now, this 2nd day of June. I don't

suppose there is over three or four feet of a bank. There may be places greater and places less. Last year and this spring so far we have had an unusual flow of water, but we have had unusually wet spells too, and rains. I don't know that I did ever know of the river having a better average flow for a period of ten months than it has today and for the last ten months. Now, as to whether I have any reason to think that the water level is any farther from the surface today than it was in 1895, in order to answer that intelligently to myself and to all I would say now with this stage of water

7258 up the underflow is up, but when it will go down now, maybe in two months from now we can walk across the river dryshod and the underflow is lower. It is farther down. As to whether that would be true when I first knew the river in the early years when it was dry, I would say when I first knew it there was more water by the year, taking it right along one month with another, than I have seen since that time, except in an unusual time like last spring and this spring.

My appointment is recommended by the governor of the State of Kansas and the appointment comes from the board of managers. The law says that the board of managers shall make the appointment, but these appointments are recommended by the governor, and then the board makes them. The board of managers is constituted of citizens of Kansas and they are appointed by the governor. The present members of the board are James Dutro, of Yates Center, Kansas; J. B. Dobbins of Howell, Kansas; and M. W. Sutton, of Dodge City, Kansas.

No, sir, none of those islands I spoke of as obstructing the river have become attached to the mainland along the river where I know it. They are more in the very bed of what used to be the channel of the river, and the trees have grown up on these sandbars, yes, sir.

7259 No, sir, I didn't know the river in the early days when this was a buffalo country and a cattle range, and I don't know as to the effect upon the growth of timber along the river or upon the islands of large herds of cattle feeding up and down the river.

As to whether I have noted that where the river is confined by the growth of islands or the narrowing of the banks, that is, where its channel is narrowed, it causes it to scour out deeper, I will say, yes, sir; and in determining whether the river is or is not carrying as much water now as in former times, I would say, I would have to take into consideration the extra depth caused by the scouring, I guess I get that idea. I will have to explain it this way. These islands are more where the channel used to be, and all around these islands on the south side of the sandbars and the sand along there is almost as high as these islands are. Wherever an island starts the drift and the wash of this sand will be in that neighborhood, right around them, off to the south side.

Now, a freshet of water comes and with this network of islands
7260 and these cottonwoods growing there in the bed of the river it don't take it but a little while for these willows and things to make a regular network of islands and then when a freshet comes it meets with this obstruction and makes a channel somewhere else, and it is making it against the lands there in the home. We have lost a power of land there this spring. Yes, sir, and it cuts islands out and deepens it. As to whether it cuts the channel out and deepens it, I would say, yes, sir, these islands make or seek another channel. Now, I mean by this that if there was a steady flow of this water there the formation of islands couldn't be made, so that I take it for granted from what I have seen that the channel was obstructed in that way. As to whether when it makes a new channel or whenever you narrow the channel of a flowing stream you make it scour that much deeper, I would say it washed out a new channel and the old bed of the river fills up; and when it cuts in a new place and is made narrower, whether with the same amount of water you will cut it deeper, and as to whether that is the effect of confining the water, I will answer, well, when it comes to a freshet that is true.

7261 As to whether I remember that last August Judge Hayt and Judge Rogers of Denver and C. C. Dawson were at the soldiers' home and called upon me there just prior to the taking of the testimony in this case at Wichita last summer, in 1904, I will say that I remember the call being made. Yes, sir, I remember that, and that I showed them over the property and the lands and invited them to dinner and that they remained and took dinner with me, and that I took them in and showed them my method of keeping track of the production of the farm, and that I sent them or gave them copies of my reports. As to whether at that time I stated that the lands of the soldiers' home were then more productive and the turnout of products during my administration had shown a regular and steady increase, and that the home had been more profitable than it had ever been in its history before or since the accounts were kept, I will say that I don't just remember of
7262 that. It is perhaps true. I judge that is correct on the books that I gave you, because that deals more particularly with the ten acres we have under irrigation, and that has been put there since I have been connected with the home. As to whether it is true that in response to questions propounded at that time I told them that so far as the soldiers' home lands were concerned there had been no deterioration or falling off either in the bottom lands in natural meadow or alfalfa because of anything that had occurred to the river, I will answer, I might have said in alfalfa, but in the prairie hay I couldn't say, nor in the growing of cereals. I couldn't say that on those crops. As to which land is more valuable, alfalfa or wild grass lands, I would say alfalfa land. I have never broken up any prairie hay land since I have been in the home. As to whether if this prairie hay land were broken up and put in alfalfa it

would not produce a greater value in crops per acre per year than to leave it in wild hay, I would say if I were farming for the market value of things that might be true, but I am farming in such shape that I have to take care and arrange for stock, and I can't use the alfalfa safely as range land, and I can this prairie hay land. As to whether
7263 I stated to these gentlemen named last summer there that I hadn't observed or didn't know of any change in the level of the ground water, I will answer that I might have talked with those gentlemen along that line; but I will tell you, when I have to drive a well and drill deeper to catch up with the water, then I know what I have done. Yes, sir, I had drilled that well before they were there last summer. If I had been talking on that subject I perhaps would have told them just the same as I tell you now. Yes, sir, they told me at that time that they were representing Colorado in the matter of suit between Kansas and Colorado. As to whether it is true that last spring, perhaps within two months past, Mr. I. B. Melville or a gentleman who said he was from the attorney general's office of the State of Colorado called on me in regard to these same matters, I will answer, yes, I remember that very distinctly; and as to whether at that time I said to Mr. Melville that by reason of my position and by reason of the manner in which I was appointed I would consider it a favor if he wouldn't call me as a witness
7264 for the State of Colorado, or something to that effect, I will say, well, to be fair, I cited you to other parties. No, not to Mr. Melville. I will name them if it is necessary. But as to whether I said this to Mr. Melville, the gentleman who had been there this spring, I will answer, it is more than likely that I did. Now my reason for saying that was this—there was any amount of men that had been living there for twenty or thirty years, and with me having a little broken chain there of two years, being absent, I cited him to the men along the river who were familiar with it. As to whether I felt that their judgment might be better on the river, I will say it might have been better for a continuation or series of years. As to whether I stated it as a reason that because of my position it would be rather embarrasing for me to be called by the State of Colorado, I will say, I don't remember saying that, because if I know my make-up, I have never been delicate, because nothing of the kind would prevent me from doing a duty. As to whether I suggested one of the inmates of the soldier's home there as one of the witnesses and asked not to be called as a witness, I will say I did.
7265 Yes, sir, I remember that he came here and testified—Mr. W. J. Spencer. My reasons for doing so was that he lived here in fort days. I did that. I was going to say why I did that, but probably you wouldn't want it. I did that from the simple fact that he had been there and knew all about the river and knew about these wells and knew about our ice pond and knew about the ice house and things that were there then, but they are now of the past; they are not there. As to whether this position which I hold is at all of a political nature, and as to

whether politics cut any figure in it, I can answer that question. With me it does not. As to whether the appointment is in any way governed by political considerations or if it is looked upon as a political appointment (objection), I would say most undoubtedly these positions come and go with whoever is elevated or on top.

7266 Yes, sir, Senator F. Dumont Smith is the State senator from this district, and I know him. Now, as to knowing that he is one of the counsel in this case for the State of Kansas, I will say I don't know that by the Senator ever telling me, but I have heard it. I don't know that I ever read it, but I hear that he is connected with it, yes, sir. As to one member of the board of which I spoke, Mr. Sutton, of Dodge City, being a gentleman who has in the past represented this district in the lower house of the legislature or the State senate, I will say I only know as a matter of history. Personally, I don't know, but as a matter of history I do know, yes, sir. As a matter of history I know that he has been in politics as well as Senator Smith, yes, sir.

As to whether I am prepared to say that the Arkansas river opposite the soldiers' home will carry less water today, al-

7267 lowing for any additional depth than when I first knew it, I will say the channel is not as deep now as when I first knew it, no, sir. As to whether it is not deeper in places where it has been narrowed, I will say, yes, but not the general trend of what was the channel when I knew it first. Yes, sir, there are islands and sandbars in it. But as to whether I am prepared to say that as it is today it will carry any less volume of water than when I knew it first, I will say it will carry the same volume, but not in that old channel.

The well I spoke of that I sank was a drilled well, and as to whether we dug down to the first water or just drove or drilled, I will say we would just take and ream down. We would take a large bar and put an auger on it and ream down. As to whether we don't stop at the first water but go through to get better water, I will say yes, sir. In saying that the water level has sunk, as to whether I refer to the better water that we use or the ground or surface water, I will answer, I refer to what is called this first uuderflow water that is standing within about twelve to fourteen feet of the surface. That is the water that has dropped away from us. But let me tell you, it is just a regular kind of filtering operation

7268 in this sand. It rises and falls. If the water stood at a regular height all the time that underflow would stand, but when the river is dry for months that first water level went away down. It lowered.

No, sir, we haven't any open wells, cellars or excavations now in which we have a chance to observe the rise and fall of this water. We did have at one time. In about 1895 we had an ice pond down toward the river. We had a pond of water there that was always there. It isn't there now. This ice pond was in a basin, and as to how far it was from the river, that would be drawing on my imagi-

nation. It was quite a little ways, but there is no difference in the rise of the land from the bank of the river. Oh, I suppose it was 200 yards from the river. All of that. As to whether there was any evidence that there had at any time in the past been an old channel or slough or any depression around there, I would say, as I learn the matter, that timber belt along there was at one time the channel of the river—was the bed of the river. As to whether
7269 the channel had shifted and is not where it was in the very early days, I would say no, sir. Now, I can't say personally, but as I understand it. As to whether I could see from my own observations on the ground that at this point where the ice pond was located, about 200 yards from the river, there had at some time been an old channel, as evidenced by any depression in the level of the ground around there, I would say I never noticed that. Yes, the pond is there, but it doesn't fill up, no, sir, only in a freshet. As to whether it fills up in a freshet from the river, I will say there appears to be a kind of system of little springs along there that when the water is up it bubbles and comes up through and runs into this cistern. It is a kind of basin. Yes, sir, there is water in it now, and it has been in there since the rise in the river, and that has been for some time. No, it has not been nearly a year that there has been water in that pond; not a year all together. As to
7270 whether the river had been dry since last May a year ago, I would say those are matters—I have not been looking after this thing. I haven't been watching that, but I know there is a much heavier head of water there now and all spring than there was last fall. As to there having been some water in that little pond all spring, 200 yards from the river, I would say yes, and there will come a time now when that will be dry for a year or six or eight or nine months.

As to whether I can fix definitely the two years I was here prior to my appointment as commandant, I will say, well, this spring and last spring—last spring we had those freshets. As to what two years I was here at the soldiers' home before I came as commandant, I will say I was here in 1895 and 1896 up to July 20, 1896. No, sir, I don't happen to remember whether 1895 and 1896 were years of rainfall and of a good, fair flow of water in the river. I can remember merely in 1895 that we were just in the scale—in the balance—that everything was going to leave us and was going to burn up. That is, as to rainfall, yes, sir. As to the flow of the river in those two years, I would say it was weak at that time—very
7271 weak. As to whether that was true as to both 1895 and 1896 or only one of those years, I am not prepared to answer that. This was in 1895 I speak of now that was dry, yes, sir. As to whether there was water in the little pond at that time, I don't just remember that. I want to answer that question in this way: That water in that pond depends exactly upon the stage of the water in the river. Now, of course I haven't kept any summary and no report of those things, because I didn't ever expect I was going to

have any such use as this for it. The reason I would know there was no water in it at that time would be simply because the river was about dry in the year 1895, yes, sir. I couldn't call to memory the year 1896.

I had a good crop in 1895 on the bottom lands, and in 1896 I didn't raise as good crops on the bottom land as in 1895. I don't remember whether there was more water in the river than in 1895.

Redirect examination.

By Mr. ASHBAUGH:

7272 Yes, sir, the ice pond was used during the winter to get ice, and when there was water in the river we did get ice off of it, yes, sir, and when there was no water in the river we couldn't get ice in that pond. Outside of the rainfall, as to whether the high water in the river would be beneficial to the bottom lands belonging to the State of Kansas, I will answer, outside of rainfall, if there is a head of water in the river this underflow is much nearer the surface than when there is no water in the river, and when it is much nearer the surface, the land is more productive, yes, sir. Yes, sir, I spoke about the river carrying the same volume but not in the same channel. If the same amount of water that would just have filled the channel years ago should now come down it would be confined near the center of the river and away from either shore or either bank. I have seen the time when it would carry a very heavy head of water and the banks would be well protected compared with what they are now. They are filled up with a network of islands and sandbars so that it is a difficult matter for a 7273 good head of water to get through there. If the same volume of water should come down the river now that in the early years would have entirely filled the channel, as to where that water would go to, I will answer, it makes one. It overflows the banks. As to how far back from the river the high water in the river affects the level of the underflow (objection), I will answer, as far back as that bottom extends. I might say to almost the base of the hill. And that is a quarter of a mile, perhaps more. Yes, sir, more in some places.

Yes, sir, I remember of talking with those gentlemen when they came down here last year from Colorado. As to whether I said anything different to them then than I have testified to here on the stand today (objection), I will answer, I don't remember 7274 saying anything of the kind. I have given them copies of our reports and cited them to different parties there that have lived there longer than I have, and as nearly as my memory serves me, I made a statement of what it was, and I always dwell on the productiveness of our land that is under irrigation. No, sir, this ice pond has no connection with the river.

Recross-examination.

By Mr. DAWSON:

Irrigation does prove of advantage to us at the home.

Yes, sir, the banks of the river at the soldiers' home have been overflowed, to my knowledge, so that it ran over onto the land. That was this spring. This it did also at the time of a freshet. As to whether it did it in 1895 or 1896, I don't just remember about that, but it has been overflowed this spring and last spring too.

Cross-examination.

By Mr. CAMPBELL:

7275 Neither Mr. Ashbaugh nor any other representative of Kansas in this case ever talked with me about it until about ten days or two weeks ago. At that time I had a talk with Mr. Ashbaugh about it. No, sir, he never had any interview
7276 with me prior to ten days or two weeks ago. I never knew anything about the suit until about ten days or two weeks ago.

Redirect examination.

By Mr. ASHBAUGH:

Yes, sir, the first time I ever saw you was on Decoration Day of this year when Mr. Scates was out with you. Yes, Mr. Thomas Scates and Judge Price and you drove down to the soldiers' home last Tuesday, and that was the first time I ever saw you to my knowledge.

Recross-examination.

By Mr. DAWSON:

Mr. Scates is an attorney in this city. As to whether he is also in politics or fills any political position that I know of, I will say I suppose all those representative men are more or less in politics, but Mr. Scates and I never talked about this subject. Yes, sir, Mr. Scates is the same Mr. Scates who is a partner of Mr. M. W. Sutton, who is a member of the board that appoints me.

7277 JOSEPH TIMMONS, Dodge City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live at Fort Dodge, Kansas, and have lived there since November, 1892, with the exception of one year I was away for a while. I have been acquainted with the Arkansas river since 1884 at this place.

Yes, sir, I used to live down at Arkansas City, and I have lived at the fort continuously since 1892, with the exception of the one year.

Yes, sir, I heard the testimony of Captain Thomas this forenoon and heard him refer to the ice pond. That ice pond was a
7278 small lake about 200 yards or so on the north side of the river, and it had considerable water in it, probably four feet. We had fish in it. We put fish in there along in 1894, and in the winter time we used the ice out of it. It was a natural lake at that time. It was always full of water. It was full of water for three or four years. I don't remember what years now. I can't give you the years in regard to that, but with the exception—I know it was in 1894 or 1895 that we put the fish in, because Colonel Cunningham was commandant of the home at that time and it was under his direction that the fish were put in there, and there was a continuous lake there—I don't know how long it had been there before—but there was a continuous lake there for some years, probably until along about 1895, and after that it went dry and we had to take the fish out and put them in an artificial lake. As to how long that pond remained dry, I will answer, it is dry yet, with the exception of some small amount of water, probably five or six inches or something like that, in it now. As to where that lake gets its supply of water, I will answer, we always supposed from the river. There was no
7279 channel flowing from the river directly over the surface into it, no, sir. As to whether its source came from the underflow (objection), I will answer, we always supposed it (objection)—we always supposed that the pond or lake as we called it was fed by the river from the fact that when the river went dry the pond went dry, and when there was water in the river the pond was full. But it didn't flow in from the river over the surface of the ground. From 1894 and 1895 and along there for two or three years it had water in it. In 1903 it was very dry. I don't think there was any water in it at any time during the year 1904. Now
7280 there probably may be two or three inches of water in it. There may be. Yes, sir, the river seems to be up now. As to how far back the river influences the underflow at the State lands at Dodge City (objection), I will answer, in 1884, 1885 and 1886 and along there I used to cross this river here at the bridge. I lived south here. And the river was full of water then. It was fully equal the year round to what it is at the present time; and by the present time I mean the amount of water flowing in the river during the months of May and June, 1905. I came then right onto the banks of the river to live in November, 1892, and a friend of mine came here at that time, and when he went away he went across the river right below the fort, right across that ford there, with his team. The water was very shallow then. I remember asking him the question why it was. Nobody seemed to know why the river was so low as compared with what it used to be.

Yes, sir, it was so low as to call attention to it. It was so low that the question was asked why you could cross the river then. Oh, yes, lower than it had been for the same time in previous years.

7281 As to how far back from the river the river influences the underflow, I will say the only thing I can state in regard to that is that we dug some wells upon what we call the pasture; that is, just about the distance from the river here, running back about a quarter of a mile at any rate from the bank of the river. We dug some wells there, and I don't know whether they went to second water or not. I can't say. But those wells went dry in the summer. They were all right in the winter, but in the summer they went dry and they had to go and dig those wells deeper until they got a better flow of water then. They got a better flow of water then. As to what caused those wells to go dry, I will answer, well, we of course thought it was on account of the river being dry. As to what effect the river going dry or being low has upon the productiveness of the bottom lands belonging to the State of Kansas (objection), I couldn't answer that question. I am not a farmer.

7282 As to the average flow of the Arkansas river during the last ten or twelve years prior to 1904 during the dry season of the year exclusive of the flood season, as to whether it is as great as it was during the early years at the same season of the year (objection), I will answer, no, sir. If the water has been taken out for irrigation purposes in the State of Colorado within the last ten or twelve years, as to whether the taking of that water has tended to make the flow of the river, exclusive of floods, either greater or more uniform (objection), I will answer, the water in the last

7283 few years, since 1891 or 1892, has been a great deal less than what it was in the years 1884, 1885, 1886 and along there at the same time of the year. In November, 1903, we travelled all over the river any place. There were islands there in the center of the river with trees growing on them, and there was no water flowing in the river in the fall of 1903. That condition lasted up into the winter time and toward spring and began along in the summer some time. No, during the summer of 1903 down to the spring of 1905 there was no flow. As to whether I have noticed any change in the channel of the river with respect to islands in the last fifteen years (objection), I will say yes, sir. In the last ten years there have islands formed in what we would call the center of the river, and they are covered with cottonwood trees. There is an island with as much as an acre out in the center of the river that has formed there in the last ten or twelve years. I have been down here thirteen years. I came here in 1892. Yes, sir, there

7284 are other islands, small islands, scattered along there. There was a large island in front of the fort, that is, on the south side, over in the center of the river there. After one of these dry spells, as to whether the river bed is as deep as it was years ago or not, I will say out in the center it is

not. As to how wide the river is between the banks, that I can't say. As to whether the carrying capacity of the river, with water at the same height, is now or has been for the last ten years as great as during the earlier years, I will answer, the river in the last ten months has had a very good stage of water in it. Before that for several years it has not had any great amount of water. As far as that is concerned, there is practically no water at all. As to the carrying capacity of the river, I couldn't answer that
7285 question. As to whether during the years prior to the fall of 1903 the river bed had been getting deeper or shallower, I will answer, why, the river carried a full stage of water from one bank to the other at that time in the years I speak of—1884, 1885, 1886 and along there. As to whether a good stage of water has a tendency to keep the channel washed, I will say, more or less. As to the effect upon the channel of the river *of the river* being dry for a long time, I will answer, it fills up with sand. That is what we find down there. It blows in full of sand.

Cross-examination.

By Mr. DAWSON:

7286 I first saw the Arkansas river along about 1881 at Arkansas City, Kansas. I was acquainted with the river up to 1884; that is, there, up to some time in the summer of 1884 when I came here, and I have been acquainted with it in this locality since 1884, and you might say I have crossed it every week once or twice all of this time. In 1884 was the time this western country was settling up and there was a great many people in here. They were newcomers, yes, sir, and a great many of them afterwards went away. There were only a few places along the river and back a ways from it where the land was fenced and improved and had trees planted in 1884. Yes, sir, the growing of cottonwoods on these islands I suppose is from the seeds scattered by the cottonwoods that have grown over the country generally since its settlement. When the country was first settled in 1884 everybody took a claim and
7287 commenced setting out trees. (Objection.) It takes a cottonwood some eight or nine years where there is plenty of water before it is grown big enough to generally distribute seeds, but there were some large cottonwoods all over this country. As to whether there were very few compared with what there has been for the last ten years, I would say, yes, sir, I think so. Those cottonwood trees growing up on these islands and along the margin of the river have principally grown there in the last ten or twelve years, and as to whether they began to appear shortly after the cottonwoods which I have spoken of as having been planted when the settlement came in had been out long enough to furnish ample seed, I will say, well, it has been eight or ten years, yes, sir. Yes, sir, there are a good many more trees along the banks of the
7288 river than when I first knew it. No, sir, when I first knew it it was not fenced in tracts like it is now. It was a range

country then. Cattle ranged everywhere and great herds were brought in here for shipment, yes, sir. Yes, sir, it is a fact that along in the early '80's Dodge City and its locality was one of the greatest shipping points for Texas cattle in the country, and when those cattle were brought in here in the summer they would be held up and down the Arkansas river until shipped. They ranged upon those hills and I suppose watered at the river. As to what in my judgment would be the effect of these large herds as to keeping down the little cottonwoods and undergrowth starting on the banks of the river and on the sandbars—as to the herds tramping them out and eating them off, I would say, oh, yes, I suppose so,

7289 yes, sir. Yes, sir, these trees have had a much better opportunity to grow since the river was fenced on both sides and the stock was confined so as not to run over them.

Yes, sir, they had such a thing as prairie fires in this country when I first came here. Yes, sir, the prairie fires did have an effect upon the small growth along the banks and margins of the river. It would kill it off, certainly. As to whether I think that in part accounts for the fact that this Arkansas river through the great plains country was sparsely timbered along its banks and that in the early days what little timber did appear largely appeared on islands which were more or less protected by the sand and water, I would answer, I suppose that was the effect of it, yes, sir.

Yes, sir, I am now living at the Fort and have been living there since November, 1892. Yes, I have a position there and I am a member of the institution also. I am hospital steward and druggist. I have filled that position for about eleven years. I

7290 have never engaged in farming and things of that kind in this country. I have been in the store business but south of this a little ways, about fifty miles south. I came here in 1884 and went from here right there. We freighted all of our goods from here. We bought everything here, and we came over for freight once or twice a week. Yes, sir, we were kept on the road most of the time and we were there all the time. That was a part of my business, exactly. I had a feed store there and I hauled all my own grain. It was a round trip of 100 miles, and we were on the road all the time month after month. We would start out on Monday and get back here on Tuesday morning and load up and start back, and we would get back Wednesday and back Thursday again. No, sir, I didn't stay in and run the store.

7291 Yes, sir, the opportunites that I had to see the river in the earlier years were those that I had in crossing it at this point. I never remember seeing the river dry at Dodge City before 1892. I never remember seeing even a low stage of water in it, even in 1888. Perhaps the reason of that is that when I came here, as I stated, in 1892, we went right on the bank of the river to settle. The other times I was crossing the bridge here and not so much interested in the river, only I noticed the river was full of water. I never saw it dry before 1892. I don't remember seeing it dry, no, sir.

7292 Yes, sir, I said in 1884, 1885 and 1886 the flow of the water was better than it was in the early '90's. There has never been until the last ten months, with the exception of just floods—there has never been such a flow of water as there was in 1884, 1885 and 1886. As to whether the years 1884, 1885 and 1886, which I have used in comparison, in the earlier years were known, all three of them, as wet years and years when there was a large flow of water in the river, I will answer, I think not, for the crops on the road between here and where I lived dried up, and I don't think that so far as the flow of the river was concerned those three years were exceptional years. I don't think so. As to what years after those were as good, if they were not exceptional, I would answer, the years, you may say, of 1887, 1888 and along there, I would think. Now, as far as the crops are concerned, as I stated before, I am not capable of answering those questions. The flow of the water is just as good now as it was in those earlier years. The first falling off that I noticed was in 1892. As to whether the years 1887, 1888, 1889, 1890 and 1891 were as good as 1894, 1895 and 1896, I
7293 will say I was not paying so much attention to it. I got used to going across the river so much that I didn't pay so much attention to it as when I was right on the banks of it.

No, sir, I have never been in Colorado and no one has ever talked with me about when irrigation on the Arkansas river commenced to any large extent in Colorado. No, sir, I don't know when it commenced. I didn't know who were the attorneys, even. I haven't paid any attention to it only what I saw in the
7294 newspapers. As to what there was about the year 1892 that makes me think that was a year when there was a poor flow in the river, I will say, the simple fact is that I moved onto that river here in 1892. A friend of mine came there and crossed the bridge coming here and drove to the fort, and when he went away we went down to the river here and he says, "Why, there is no water in the river any more; I can drive right through here and go south." That was about the 27th or 28th day of November, just after Thanksgiving. As to whether it has always been true of this river that with very rare exceptions the flow in the late summer and fall was very, very small, I can't say as to that. No, sir, I don't know as a matter of history that this river was dry here at Dodge in 1879. If I have I have forgotten it.

Yes, sir, I said this ice pond down there had water in it for about two or three years, enough, I think, so that we had fish in it, along about 1894 and 1895, I think, and 1896—along there. I can't state positively the years. Yes, sir, and I thought that water came from the river. That is what we thought. As to our making any investigations to determine that fact, I will say, well, there was no other cause for it to come from that we knew of at that time. Yes, sir, that was our judgment, certainly.

7295 As to the flow of the river in 1894, 1895 and 1896, those years when there was water in the pond, as compared with

the years 1892 and 1893—the first two years I was at the fort—I will say that in 1894 and 1895 there was a very fair flow of water in the river. This little lake I speak of had plenty of water to keep fish in and get ice off of it in the winter time. As to how deep it would be at the deepest place, it was so deep we couldn't cross it at some times; probably two or three or four feet—somewhere along there. Yes, sir, in 1894 and 1895 there was a fair flow of water in the river. I will admit that. As to how that flow would compare with the flow I now see out of the windows of this court house, I will say, oh, it was not so much. It is more right now, yes, sir. I think we have had more in the last eight or ten months than during any seasons in 1894 and 1895. No, the pond is not still there.

7296 It has been opened out. We banked it up on one end of it, and on one side of it there was a low place that let out toward the river. Yes, the depression is still there. There is a small one there now, but it has been gradually filling up. No, I didn't notice that Captain Thomas testified this morning that it was the same. (Objection.) As to how much the bed of that hole at the lowest point is filled up more than it was in 1894 or 1895, I would say, oh, several inches. I don't think quite a foot, and probably there are three or four inches of water in it today. There were a few days ago. I can't say what there is today. If that depression has only been filled up a few inches—a foot at most—since 1894 and the water in that is dependent on the river, as to why in my judgment it is that there is not a greater depth of water in it when the river has been higher for ten months than it

7297 was in 1894 and 1895, I will say, yes, I can tell you why. As I said, there is an outlet in that pond, and that outlet was filled up at the time we had so much water in it, but that has been taken out. It was put in with plank and that has been taken out now for the last several years, and there is no water, only with the exception of a little surface water in there at the present time. Yes, sir, the way we got three or four feet of water in it in 1894 and 1895 was by damming it up at the lower end with plank. It was natural with the exception of one small place. So far as the depth of the water is concerned, which is now in the pond, as to whether in my judgment it would be as great as it was in 1894 and 1895 if it were dammed up in the same way, I would say I think it would just at the present time, and for the last eight months I think it would be. The river having been as high or higher for the last ten months than I have known it for any ten months along in the '90's, as to whether I think the level of the water underneath the ground on the State land would be as high now as it was then, or as to whether I know anything about the level of the ground water, I would say no, I do not.

7298 As to where those wells were and what they were that I said went dry in the summer and had water in the river, I will say, they were probably a quarter of a mile back from the river, on the north side of the road as you go into the Home, and they

would go dry along in June and July, along in the summer, July, August and September, and they would begin to show a falling off along about the first of July. As to whether they would then show water again in the winter, I would say, no, we only permitted them to do that once. We sank the well down eight or ten feet farther. No, I don't know how far when the well was first sunk they went to strike water, and I can't say as to whether the water that was in these wells that dried up was the first water or the water below the first water. I simply know that the wells went dry. I
7299 couldn't say whether the river had any effect upon their going dry or not. We supposed that, of course, all the time. That was the supposition. They were bored wells. Oh, yes, you can look down into them and see the water. We had plenty of water. Yes, sir, they were cased up. The water came up from the bottom, if I remember right. I think the first well in the pasture that filled up was twenty-five or thirty feet. That was away up in the pasture, and that was the well I am principally speaking of that went dry along in July. It was put down in the spring and along in July that well went dry and then they bored some ten or twelve feet deeper. No, I can't tell you whether in sinking that well twenty-five feet deep they went through a stratum of water before they got that deep that they didn't consider good water.

Yes, sir, I stated that it was the supposition that the water in this fish pond came from the river. I suppose that is because we saw more water in it when there was more water in the river. I should say the higher the river was the more water we had in the pond, yes, sir. The rise of water in the river produced, as I say, more water in the pond. Well, no, we never made any investiga-
7300 tions or borings to find whether the water in the pond came from the river, and as to whether the rain all over the broad country that produced more water in the river might have produced more water in the hole (objection), I will say, I can't answer that. I would say that I have known this river only in this immediate vicinity.

7301 No, sir, I don't know of any places where parties have aided nature in attaching some of these islands to the mainland by stopping up little channels.

Redirect examination.

By Mr. ASHBAUGH:

7302 As to whether there were cottonwood trees along the river when I first came here, I will say oh, yes, down where I live now there were cottonwood trees there that were set out when I came there, twenty years before I came there. These were very large trees, yes, sir, as large as ever grow. There were no islands ten or fifteen years ago, at the time I speak of, no, sir.

Recross-examination.

By Mr. DAWSON:

No, sir, it is not a fact that those cottonwoods that were set out in the first place by the army people were selected with special reference to getting a tree that bore no seed. You can come down through that place and find them full of seed now. There is a few of them that don't bear, but there is entirely too many for us people down there that do bear seed.

7303 P. H. YOUNG, Dodge City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Dodge City Kansas, and have lived in Ford and Edwards counties since January, 1879. I have been permanently located in Dodge City since 1887, and the other eight years, probably four of them I resided permanently in Kinsley. The rest of my time my ranch probably was right on the line of Edwards and Ford counties, right on the Arkansas river.

I have been acquainted with the Arkansas river since 1879, and during those earlier years I was in the cattle business, and that brought me in contact with the Arkansas river and the Arkansas valley. Yes, sir, I was located on the Arkansas river.

7304 Yes, sir, I have been familiar with the flow of the river since 1879. As to how the average flow of the river, outside of flood periods, for the ten or twelve years prior to 1904 compares with the flow of the river during the same time of the year in the earlier years that I knew it (objection), I will say, well, now, in 1904 we had a great deal of water in the river, the same as we had this year. Barring 1904, I should say the water was a great deal less between 1904 and 1890 than it was between 1879 and 1890. In other words, in the first six or eight years of my experience on the Arkansas river I never saw it dry. During the period from 1890 to 1904 I have seen it dry as much as six months in a continuous stretch of time. As to the flow of the river during the fall of 1903, I will say it was dry, but in that year I was located here in Dodge City and my every day business was not crossing the river, but if my memory serves me right, it was dry. During my earlier period here I was located right on the river bank. During the last ten years I have also been engaged in the cattle business right

7305 on the Arkansas river, and up until something like two or three years ago I drove from here to my ranch almost once a week the entire year. Since that time I have been taking the Rock Island to Bucklin and haven't come in contact with the river so much. My ranch is located north of Bucklin, and until recently it joined the Arkansas river, but recently I sold the land adjoining

the river and now it runs from one-eighth to one-quarter of a mile all along the river for four or five miles.

As to whether or not on my ranch and along the river the water is nearer the surface under the bottom lands when the river is up than when it is low or dry (objection), I would say it was, yes, sir. As to whether the level of the water under the bottom lands corresponds with the condition or the level of the water in the
7306 river (objection), I will say yes, sir. As to how far back the condition of the river affects the level of the water that I have just spoken of (objection), I would say that varied a good deal according to localities. In some places it might be a hundred yards and in other places it might be five miles. As to whether I know of places where the river will affect the level of the water under the land five miles back from the river, I will say, yes, sir, it is apparent in the wells I have. (Objection.) The way I account for it is, you take a week or two or three weeks after the river flows full, the water is higher in those wells than it is during dry periods. Those wells are located on the south side of the river on my ranch, and the particular well I speak of is located three or four miles from the river. As to whether from the condition of the
7307 water in that well I could tell the condition of the water in the river as it was a few days prior to the day of observation, I will say I could not now, because I have converted the well into a tubular well, but in former years this was an open well. When it was an open well it was noticeable that it was higher during flood periods or after the flood or high water had continued for a period of time. It was noticeable back that far from the river, yes, sir.

Yes, sir, I know of the fact of their taking water for irrigation purposes in Colorado for ten or fifteen years. As to whether the taking of this water for the last ten or fifteen years has tended to increase the flow of the river during the dry season of the year (objection), I would say that it would be my information that it has lessened it instead of increasing it. Yes, sir, that is based upon my observation along the river here and is my judgment of it.
7308 (Objection.) I base my judgment on that fact that in the early days when there were no irrigating ditches in Colorado the river continuously had water, while during the years of a great deal of irrigating ditches being built west of us the river was dry for six months at a time, and I would naturally suppose that the water taken out up there could not get down here.

As to the artesian wells down south of here, I may say I only know that there are such. I don't know anything about them. No, sir, I couldn't tell you what effect the amount of water in the river has upon the strength of the flow of some of those artesian wells.

As to the condition of the country just north of the little ridge that Dodge City is built on, I will say I have been out there a good many times by Duck creek and through there, yes, sir. All of that country drains east and a little north, into the Pawnee.
7309 There are no streams in Ford county that drain into the Arkansas river on the north side that have water in them out-

side of flood times or heavy rains. Yes, sir, the whole drainage within a couple of miles back from Dodge City and the north bank of the river drains north and northeast into these creeks that run into the Pawnee river. Yes, sir, I know where Coon creek rises. As to which way the land drains around the source of Coon creek, there is a little divide between the Coon creek drainage and the river and then another one that drains into the Sawlog. The Sawlog drainage is much the larger, having draws or creeks, called Five-mile and Eight-mile and various names of that kind, that drain into the Sawlog for quite a considerable distance. Coon creek drains into the Arkansas river down in Edwards county. Yes, sir, the territory say for five miles around the source of Coon creek drains into Coon creek and then down to the northeast into the Arkansas river. The divide is very close to the Arkansas river all along the north side. As to whether Coon creek is lower than the Arkansas
7310 river (objection), I couldn't tell you that, I am sure. I haven't any occasion to know that.

Cross-examination.

By Mr. DAWSON:

I first settled there in Edwards county in 1879. I landed at Offerle in January. That is some seven or eight miles north of the Arkansas river. During the summer I moved down right on the banks of the river, right on the line of Edwards and Ford counties, and made my headquarters there and worked south with cattle for something like four years, permanently. Then I lived at Kinsley a while there and was engaged in the jewelry business. Dur-
7311 ing that time I was a single man. I still continued my stock interests on the river between Edwards and Ford counties, or right on the line between Edwards and Ford counties, and I continued there in Kinsley in the jewelry business until 1887 and then came here and I have been engaged in the jewelry business here and am still in it.

No, sir, I never saw the river dry in those earlier years. No, sir, the river didn't go dry in 1879 to my knowledge. That was
7312 my first year on the river. I would say it had water in it continuously during the latter half of 1879. The first half of the year I was not on the river. By the latter half I mean from July on to the first day of January, 1880. As to how the average flow of the Arkansas river in this locality for the past ten years as a whole up to the present time, including all stages of the water, compares, in my judgment, with the flow of the same river for a like period of ten years in the earlier days since I have known it, I will say, to answer intelligently I would have to make it conditional, I think; that is, I would have to say that the last two years we have had probably as much water as any two years. Within the other eight years the river was dry more months in the year than in any other years I have known it. As to

whether this river has always been a varying river and there might be one year or a stretch of several years that it would flow more or less than the normal, I don't know as I could say that. It is higher and lower, that is true. And so far as my judgment
7313 goes, all rivers vary in their flow. I couldn't say that this river varies more than any other river I ever knew in the humid country because of the fact that it is an arid country. Anywhere I ever lived it has varied a good deal at different times of the year.

I was seventeen years old when I first came to this country. Yes, sir, I engaged in business for myself at once. As to whether I can give any comparison between the last ten years as a whole and any other ten year period since I have known the river, I would have to make the same answer to that as before—barring the last two years. Not barring the last two years I can't make a comparison intelli-
7314 gently. No, sir, it is not because I desire to exclude the two years that show a good flow in the river that I can't do that; it is because of the flow of water in the last two years. And the reason I can't make an allowance for that the same as I can make allowance for the greater flows in the earlier years, it is because I know it would be a hard matter to know how much water it would take to fill up the dry sand in those earlier years. I know it would take a good amount, because it was weeks and weeks coming thirty or forty miles when the water would finally come, to fill the dry sand, and now it comes in a night. We get information one evening and next morning the banks are full. No, sir, I can't say that there has ever been any period for ten months since I have known the Arkansas river that the flow of it has been any better on the average than for the last ten months. I can't say that there was. As to whether I know as a matter of history that they commenced to irrigate in Colorado long before they ever saw the Arkansas river, I would say, possibly. I don't know. No, sir, I don't know
7315 one way or the other. They have been building a great many ditches since I have been going to Colorado, which is now fifteen years, pretty nearly every year. As to whether they were irrigating there since 1879, I don't know that.

The one well I have referred to is between three and four miles from the river, where I said it shows the influence of the rise and fall. It is on what we call uplands. Yes, sir, and this shows the influence of the river. As to how much the water would rise or fall in it, I don't know as to that. No, sir, there is no old channel of the river showing that at some time in its early history it had gone around there through where this well is. The well is in the neighborhood of fifty feet deep. As to how high the land is above the river, I would say the top of it would be at least fifty feet above the level of the river. No, sir, I never ran a level to see whether the water in the well and that in the river were on the same level.
7316 This land is right straight north of Bucklin about four and a half or five miles, on section 17, right on the town site of

Fonda or what used to be the town site. No, sir, I don't know as a matter of fact that the United States topographical map shows that the elevation of the Fonda town site above the Arkansas river is 78 or 80 feet. I don't know it. If my well is fifty feet deep and it be true that Fonda is 80 or 78 feet above the river, as to whether the level of the water in the well must be 20 or 28 or 30 feet above the level of the water in the river, well, I simply know this that there is not a well in my locality that is 80 feet deep. I have neighbors that are at least ten to fifteen feet higher than I am and their wells are not 80 feet deep. I haven't a neighbor who has a well 80 feet deep within two miles of me. I have dug—I was going to say half a dozen, but there are not that many—I have dug four wells, and from any observation that we can make we have struck the water on the same level in all of them. If my well is fifty
7317 feet deep and the ground at that point where the well is sunk is seventy feet above the Arkansas river, as to whether the level of the water in that well must be twenty feet above the level of the water in the river, I would say, if the ground is that much higher, assuming that to be a fact, yes, sir. If I thought that was the fact I would not think that the rise of the water in the river causes the rise of the level of the water in my well which is already twenty feet higher in the well. But I don't think that land is that much higher, notwithstanding that the Government may say so. No, sir, I never ran a level to know. I never did. As to knowing as a matter of fact that in running levels back from the river at right angles with it in the neighborhood of Dodge City and up and down the river both ways east and west of here it is found that the level of the ground water rises as you go back from the river rather than staying on a level with the river (ob-
7318 jection), I would say no, I don't know anything about that. Yes, sir, I base my belief that the river water has an effect on the water in the well on the fact that the water in the well rises and falls when the river rises and falls; and furthermore, I have dug so many wells along this river bottom. We used to change camps and we would take a point and put down a well in an hour, for instance. Lots of times we would take a spade and dig a hole for a well. Since I have had this ranch north of Bucklin I have dug a good many wells at different distances from the river, and we never missed our judgment on how far we would have to go, more than three to five feet. Yes, sir, it is true in my locality on the south side of the river that wherever we dig we get water, but it is not true on the north side. I know of places within a mile of the river where they went in all probability within a hundred feet below the river and got no water. You could go off less than a quarter of a mile from the hill and get water in from fifteen to twenty feet. No, sir,
7319 there is no other circumstance than the observation in digging these wells that leads me to believe that the river water has any effect on the water in the wells. As to whether I ever thought that the same conditions that produce high water in the

river might produce the high water in the well, rather than one being dependent upon the other, I would have to say in answer to that that our rise in the Arkansas river does not come from local rains but from Colorado rains. As to whether water travels under the ground as well as on the surface, if I understand your question, my answer would be that when the water is high in the river, travelling down the slope, it is also travelling down the slope back from the river. Certainly the whole general country slopes as the
7320 river does and the water travels underneath the ground just the same as it does in the river. As to how long it would take this well three or four miles back from the river to be affected by the rise of the water in the river, I will say I never paid any particular attention to that, but my observation has at various times been called to the fact that the water was higher in the river, and upon consideration it would almost invariably—I wouldn't say invariably—be evident there had been considerable water in the river. As to how long it would be, I should judge two or three weeks. I never paid any particular attention to the period of time, in fact the water might have been up in the well a week or ten days or two weeks before we had given any particular attention to it. The only time we observed it was when we went into well to fix it or something of that kind. It is now a tubular well; it was then an open well.

There is no creek, slough or stream nearer Fonda than the Mulberry at Ford City, and that is between seven and eight miles from Fonda, I should say, west of it, on the same side of the river.
7321 As to whether Pawnee creek and Coon creek that I have spoken of are divided from the Arkansas river in Ford county by a ridge or swell of ground, I would beg to call attention to the fact that I didn't say the Pawnee was in Ford county. My testimony I think you will find was that the Sawlog emptied into the Pawnee. Not in Ford county, however. Yes, sir, there is a divide between the Sawlog and the Arkansas river. Coon creek empties into the Arkansas river; the Sawlog empties into the Pawnee, and the Pawnee empties into the Arkansas. No, sir, I don't know what the depth or pitch of the underlying strata of the country is in the neighborhood of Coon creek. As to the capacity of this country to produce crops for the last five or six years as compared with the earlier years when I knew it, I will say it is considerably better.

As to the values of land here now as compared with what they were in the earlier years, I would say they are decidedly better. I guess that would hold good as a whole. Of course they are considerably better than they were during the '90's, but for a period before that they were also higher, and after that. Outside of
7322 any boom time the value of farming land, both valley and upland, is better.

As to the general condition of the country in Ford county as to

prosperity now compared with any other earlier period, I will say, barring what we call boom periods, I would say it was better.

As to whether the wells that draw water from the ground have increased to any material or great extent in Ford county in the last twelve or fifteen years, I would say I don't know whether there is a greater number now than there was fifteen years ago run by windmills and other devices or not. There was a period between this time and fifteen years ago when there was a decided increase in wells. Fifteen or sixteen years ago was the period when our country was in pretty good condition and we possibly had as many people as we have now. Yes, sir, that is what we called our boom time, when the country first filled up. Yes, sir, there are more wells in operation in Ford county now than there were ten years ago. I should say there was quite a good many more. Yes,
7323 sir, there is quite an increase in the amount of land under cultivation now as compared with eight or ten years ago. As to whether these wells operated by windmills are operated with a good deal of regularity or pumped most of the time, I would say, well, no, I expect hardly. Most of them have tank capacity which, in order to keep the mudhole from getting around them, they shut off when the tank is full. Of course there are some stock men that don't pay much attention to shutting them off but let them run continuously. When they overflow they overflow. As to how many wells there are on an average to the acre throughout this country, on a rough estimate, I would answer, that is a pretty hard question. There are localities where there are twice or three times as many as in other localities. Of course they don't get down to a quarter section at all, I wouldn't think. For instance, I have 5,000 acres and I have five wells on it. There is a well to a thou-
7324 sand acres. But I think probably the average would be greater than that, because in the farming communities it would be much greater than that. Including the towns, as to the average of these wells, that is a random answer for a man to make without stopping to think. Of course you take some of these little towns and there are a good many wells on one quarter section, and then there are a good many with a thousand acres with only one well on it. I think that one well to about 500 acres throughout the country is as nearly as I could guess at it. It is simply a random guess, that is all.

Yes, sir, I have been out in Colorado a number of times, and as to whether I know that May and June along the Arkansas river in Colorado are months when they largely irrigate, I would answer, I don't know, whether they largely irrigate during those months or at other seasons. My trips to Colorado have usually been in the fall of the year. Yes, sir, whether they largely irrigate in May and June or not, there has been an ample and well sustained flow in the Arkansas river during the past month of May and up to the present time in June. Yes, sir, you were correct in understanding me to make the statement that the local rains did not materially affect the

flow of the Arkansas river in this locality. As to whether such a rain as came a few days ago and made the rise in Duck creek which resulted in the drowning of four people had any effect on the river, I don't believe the effect would be noticeable. I have never observed any effect on the river from local rains. Yes, sir, it is a fact that within a week or two past there was sufficient local rain to raise the stream known as Duck creek, which eventually empties into the Arkansas river. I think there is no question
7326 about that. As to how I account for this large supply of water so early as April and May which the Arkansas river has had before the time of the melting snows if it is not affected by rains, I will say, judging from the trouble that the Santa Fe has with this little creek called the Purgatoire up here, that a large amount of it comes from there. I suppose that was rainfall. I don't know what caused the Purgatoire to rise. As to whether the Purgatoire is at this particular time running practically no water, I don't know anything about that. I know that within ten days ago our trains were all laid up from six to eight hours on account of the high water in the Purgatoire. We got no trains here until afternoon that ought to have been here in the morning; but as to whether the river was higher on those days than it is right now, I couldn't say. I made no observation of that. And as to whether since I have been in the jewelry business here in Dodge City I have paid special attention to the river and the amount of water it carries, I will answer that up until the last three years, as I stated, when I was driving I forded the river almost invariably when it was not too high, because at that time my home ranch was located on the banks of the river between Ford City and the Buckbin City bridge, and I could get to it easier and nearer by fording the river than by going by the bridges, and with the exception of the last three years I did pay special attention, because I had to cross it. That averaged possibly once a week during the summer season.

Redirect examination.

By Mr. ASHBAUGH:

7327 I have 5,000 acres of land in my ranch.

Speaking of those people being drowned on Duck creek, I couldn't tell how wide Duck creek is at the place where they were drowned. I have been all along that creek but I don't know just exactly the place where they were drowned. They have changed the roads in recent years more or less. Duck creek is a deep running stream. The general stream is a deep high bank stream.

7328 As to the wells that I have dug at different places along the banks of the river, and as to whether those wells also rise and fall with the condition of the water in the river, I will answer, the open wells were of course very noticeable in the rise, but a good many of those wells were driven into the sand. The sod was cut out and a point driven down in. In those we couldn't tell the con-

dition. Where we dug open wells along the shallow places the rise was very perceptible, in fact the water often rises above the surface of the land when the river is full of water, in what is known as swags—sloughs in a wet country they would be called. As to whether the water back from the river rises and falls according to the rainfall that might have come here to any perceptible extent, I would answer, that has not been my observation, no, sir. As to whether there is a difference in the appearance of the river from Dodge City down to Ford now from what I knew it first (objection), I should say there was a difference. There is a great deal more timber growing along the river at the present time than there was in any of the early days since my remembrance of the river,

7329 and the banks have changed in various ways. There is a great deal of land made along the river. Islands or bodies of land that were formerly islands have become attached to the mainland and filled up and grown up with trees. Islands that existed in the earlier days have become attached to the mainland and now are part of the main body, all filled up and grown up with timber and brush and things of that kind. They attach themselves to the mainland naturally. As to whether there were sandbars in the early days when the river was low that are islands now and grown up with trees, I don't know of any island that exists in that way at the present time. I can't recall any island that exists that way. As to whether the carrying capacity of the river, with water at the same height as judged by the banks, is now as great as when I first knew it, well, I don't think the carrying capacity is as great as it was in former years.

Recross-examination.

By Mr. DAWSON:

7330 As to what the effect on the bottom of the stream is if you confine the channel—make it narrower—as to scouring out the bed of the stream, I would say I should judge if the same flow of water went down it would either have to get out of the bottom or else get out of the banks. As to whether this river as it now flows, if it has narrowed up in places, has scoured out deeper, I would say at the last observation I had of the bottom of the river I don't think it is any deeper. Yes, sir, these islands I speak of as having been attached to the mainland have been in places where the abutting land owner has aided nature in attaching an island to his land by putting in obstructions so that it may close up a small channel and thereby attach the island to his land. No, sir, I haven't noted any more than one place. In the place I have reference to the party accomplished his desire and effect, and I don't know how much land he acquired. The place I have reference to now is right here at Dodge City. The first time I crossed the Arkansas river at Dodge City I crossed on three bridges. The

longest bridge was as long as the bridge we have today, and
7331 two other good size bridges, before I got into the city. And that land has all been filled up, in fact our entire park here at one time, and the race track, were away in the river, and as I understood and have always understood, it was aided by filling up and the channel was diverted, and as time went along the bridge was taken out, and so far as appearance is concerned now no bridge is necessary. As to whether that particular grab of land narrowed the river channel, I would answer, I am not very much of a judge. The channel used to run between this livery barn and Mr. Fasick's house. I should say that was at least 500 feet. I should judge it was a block and a half.

Yes, I spoke of the Purgatoire having raised the river a few days ago. I know where the Purgatoire comes from. My opinion would be that that rise was rain and snow, which increased it very materially—more than melted snow, much more than a rain if the snow
hadn't been there. As to whether we have sudden rises in
7332 the river here sometimes in the summer coming from Colorado and New Mexico that are entirely due to rains at a time of the year when there is no snow, like last October for instance, I should say the rise of last October was largely due to rains; and as to how I account for it that these rains two or three hundred miles west of us in Colorado influence the flow in the river here and still say that local rains have practically no effect, my answer to that is that the slope tributary to the Arkansas river and the Purgatoire and numerous other rivers, as I understand there are up there, is much greater than the natural slope to the river here. On the south side here, from here east, and in fact west, the soil is very sandy. The water is practically absorbed as it falls. On the north side, the divide is very close to the river and the shed that slopes to the river is small. And for that reason I expect it runs off faster up there and more of it gets away. I expect it does. No, that is not the way I account for that effect in the river. I say the slope is greater. A greater area of country is drained into the Purgatoire in that country than here. The slope to the Arkansas river is much greater. As to how many miles of water shed there are between
here and the Colorado line on the Arkansas river, well, I
7333 don't know. I don't know as a matter of fact that the rainfall in Kansas or even in this part of Kansas is greater per annum than it is in Colorado. I know we don't have the amount of water here that we do east of here, but as to what Colorado has, I am not familiar with that. No, sir, I don't know from merely looking at the soil and class of vegetation we have in riding along the railroads in the State of Colorado that there must necessarily be less rainfall per year than there is here. (Objection.) My observation in that respect is this—they might have just as much rain and it would come in hard, dashing, quick rains and not get the effect it would if the rain continued for one two or three days. If

the rainfall east is as great or greater than in Colorado and
7334 it does not affect the river, as I say, as to where it goes, I would answer, I didn't say that it didn't affect the river in Colorado, but it don't affect it here. As to where the water goes, it goes into the Sawlog creek and empties into the Arkansas river, and that part of it that falls on this side of the divide comes into the river, what is not absorbed by the earth. No, sir, I don't mean that the reason it didn't largely affect the river is because a great deal of it is absorbed by the earth. The reason I don't think it affects the river is because the slope right here is not more than one mile down, and with a slope of one mile you can't get as much water as with twenty or thirty or forty or a hundred miles, and of course more of it soaks into the ground than would on a steep bank. Yes, sir, undoubtedly the rain goes to help make this ground water or underflow. On the south side of the river where it is not too deep that is the effect, because the soil is sandy and it absorbs a great deal of water. On the north side of the river I don't think
7335 that holds good, because the water floor is materially different. You can go within a hundred feet of the river bank and not get water within 200 feet, when you would be 150 feet below the bed of the river. There is a shale along the north side that changes the water floor. You don't get it on the same level.

As to how much territory there is throughout Ford county where you can go along close to the river bank and not get water, I would say, I know there are several places where people have tried to get wells and couldn't. I specifically only know of two particular locations where they failed to get water. One of those is eight miles down the river on Mr. Carson's ranch and another one is, I expect, something like twenty or twenty-five miles right down the river.

Redirect examination.

By Mr. ASHBAUGH:

As to the water slope right north of the river here being about a mile only, sloping toward the river, I will say I think it is not more than a mile, in fact the identical location is within a hundred miles of this stand-pipe up here, and from that point it flows into
7336 Duck creek, and from that into Sawlog, and from that into the Pawnee. I don't think it is a mile right here in town from the divide. So that the great space of country north of here doesn't drain into the Arkansas river. Not at this point. It must go down below, yes, sir, and does go down as far as Larned before it gets back into the river.

Yes, sir, I should judge the general prosperity of the county is greater than it was ten years ago. That is true all over the country. It is not so here any more than in other parts of the country so far as I know. Every paper you pick up speaks of the general prosperity. Yes, sir, I am familiar with the hay lands along the Arkansas river, and I should say that the underflow does affect these

hay lands. (Objection.) The higher the underflow the better the crop and the lower the underflow the poorer the crop. (Objection.) That is true when the river is not too high. In some of the bottoms the water rises up and stands in them, and that ruins the hay.

Recross-examination.

By Mr. DAWSON:

7337 As to what proportion of the lands are injured by too much water as compared with those injured by too little, I should think there were more injured by too little than too much. Yes, sir, notwithstanding what I say about the productiveness of the hay lands, they are worth as much today along this river as they have been at any time in twelve years.

7338 JAMES M. IMEL, Dodge City, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live at Ford, Kansas, and that is about twenty miles southeast of Dodge City, in the southeast corner of Ford county, and at the present time I live within about a mile of the Arkansas river. I own 1,200 acres of land along the Arkansas river which has two and three-quarters miles of river frontage. There are about 800 acres of bottom land in that. As to the width of the valley, the widest place on the land I own is about three-quarters of a mile, and it runs to a point to the east and partially so at the west. I am on the
7339 north side of the river. I located in Ford county in 1878 and have lived here continuously ever since. I have lived about twenty-three years there on the bottom and at Ford and have been acquainted with the flow of the Arkansas river all these years that I have lived there. As to how the flow of the Arkansas river for the last ten or twelve years prior to 1904, exclusive of flood periods, compares with the flow of the river at a similar time of the year for the first ten or fifteen years I knew the river (objection), I will answer, I think the flow has been a great deal less. It has not been so regular. When we first came there the first time I ever remember crossing the river was in 1879, on the 4th day of July. Then the water was about up to the axle of a spring wagon we were in. As to the river not being so high in these later years, it appeared
7340 like when the water got down to a certain flow it was checked up all at once, almost, and the first thing we knew the river was dry. As to when we noticed the flow of the river decreasing, I will answer, we noticed it the most about 1887, 1888 and 1889. As to how long that decrease continued, I will answer, it has been that way clear up—well, from about a year ago it has been running I guess all the time. But the year before last it was dry nearly all

the season. From August, 1903, until May, 1904, I don't think there was very much water in the river. My house is less than a quarter of a mile from the river, and we could see it plainly before the trees grew up. We are right at the river. We were there, I guess, ten years before the trees began to grow.—They have not been growing with us very long—about twelve or fifteen years.

7341 Those trees are growing along the river on the made land. Yes, sir, there is a great deal of made land along there. As to how wide it is along my two and three-quarters miles of river front, I will answer, I never measured it, but it takes up about one-third of where the river used to occupy. Yes, I mean to say that the river bed is about two or three times as wide as it used to be along my land. Yes, sir, there are islands in the river along there. They were not all there when I came there. There always were some islands there. Some of them have filled clear up. The land is filled up to the other land, most of them, so that the islands are now a part of the river bank, yes, sir, and those islands or sandbars have grown over with trees, as well as trees along the banks, yes, sir. As to what I think is the cause of the river banks narrowing and the river bed filling up (objection), I will answer, well, it must be on account that the water doesn't flow all the time and it gives the vegetation a chance to grow

7342 without the water. The willows are allowed to grow, and the river bed being dry and no water in it the sand blows out and the willows keep growing and spreading in toward the center and the sand keeps blowing out. That is the way it worked with us. This condition extends up and down the river so far as I have been on the river, and that is up the river as far as Dodge, as far as I can see here where we cross or where we come close to the river, and it extends below Ford as far as I have been. I have not been in the last few years very far below—eight or ten miles.

As to how deep it is to water on my bottom lands, on an average, I will answer, we have some bottom lands that are very close. We call it low bottom. When I came there the water wasn't only about two feet under the surface. We have land then that it is maybe six feet, and we have land eight or ten feet to water. As to the water level under my bottom lands having changed any in the later years (objection), I will answer, yes, sir, we can tell very

7343 easily in this lowest bottom, of course, that the water has gone down. I mean by that, yes, sir, that the water level has lowered. As to the extent it has lowered, I think about three or four feet. As to how far back the river has an effect on the underflow beneath my bottom land (objection), I will answer it has an effect at the widest place a little over half a mile. I don't know if that is practically back to the uplands. Not right back to the bluff, but it is up to where it begins to slope. As to having any

7344 specific instances showing how the water level is lowered (objection), I will answer, at the lower end of my bottom lands the drain from the bottom has washed out enough so that—it used

to seep out from the bank. There would be a seep and there would be some water standing there in that draw, but that has quit. We have to have some of these rises—a flood—to produce that any more. Yes, sir, when a flood has been in the river for some days or weeks the water will rise there as it did in the early days. As to what effect the lowering of the water level has had upon my bottom lands (objection), I will answer, when we first came there we never failed of hay. We cut that bottom twenty-three years, and the last years some of the driest seasons—now, the water used to come down more regularly than it does now, and it would
7345 keep the moisture, but the last few years it has changed our grasses. We haven't had half the hay. The last year I will say we have scarcely any hay. It went from a ton to a quarter of a ton to the acre. As to what I attribute that loss to, I will answer, to a want of moisture, because it is farther to water. It changed our grasses. Last year there came up weeds when it would rain. As to what is the source of supply of the underflow (objection), I will answer, it surely is the water that runs in the river. It spreads out over the country in the sands.

As to my being acquainted with the location of the sources of Coon creek, I will answer, yes, sir, I lived on Coon creek once. The sources of Coon creek are about seven miles from my land. As to which way the land drains around the sources of Coon creek for a few miles—whether toward the Arkansas river or toward Coon creek—it runs toward Coon creek. There is a dividing line, like. It runs toward Coon creek and toward the river. As to how
7346 wide the space of land that drains toward the Arkansas river is right along there, I will say I think there is a little more goes toward the river. Two miles, I think, north of me goes to Coon creek and about five miles goes the other way. As to what is the origin and source of the waters that flow into Coon creek (objection), well, in rainy seasons it is because of rain, but after being there a while we found out that there was a sort of underflow to Coon creek too and we found sand there and running water. It appeared to run toward the east in about the same direction the river runs. Yes, sir, Coon creek has a flow at its source when there have been no rains for a long time. That water, I think, could not come from surface rains. As to the valley of Coon creek being above or below the bed of the Arkansas river, I don't know. I am not acquainted with the valley of the Pawnee at all.

Cross-examination.

By Mr. DAWSON:

7347 Between 1878 and the time I settled on this land I now occupy I was located about four miles south and a mile west of Spearville. No, sir, not on the river. I have been on the river there all the time for about twenty-three years, and of course crossed the river many times during that time, and we held cattle there

from 1881 on that river. No, sir, from 1878 to 1881 I was not living on the river and not interested in lands along the bank of the river. I think I bought these lands where I now am in 1881, but we didn't move down there until the spring, in March. That would be in March, 1882, when we moved down on the river.

I first noticed a marked falling off in the flow of the river in about 1887 or 1888—somewhere along there. Of course I haven't
7348 got the dates. I can't bring anything to mind in 1889 so as to answer that the decreased flow had so fully developed that it was plainly observable just as to 1889, but I know along in about that time it appeared that—it was in 1885 and 1886 there was lots of water in that river. I remember that. We had a bridge put in there about 1886, and we haven't had to cross so much, and of course my information has not been so marked so that I could state the time since 1886 so much as it was before, because we handled cattle, and of course the cattle would get on the other side of the river and give us a good deal of trouble, and I remember that. I crossed the river on the 4th day of July, 1879, and it was up about to the axle of the spring wagon, but I went down east along in October, and if I remember right I struck the river there at Kinsley. I think
7349 the river was dry in October. I can't remember whether in 1880 it was dry or not. I can't say. I don't remember anything, but it appears to me as though we had lots of water that summer, because we held cattle down on the river in 1881. I know we went over there a-plumming in 1881, down below my place, that is, when we lived down on Coon creek, and we had to carry the plums over. We couldn't hardly get back on account of that river, and it was full from bank to bank, that is, it was not in a little narrow channel like it is now. As to its being a little narrow channel today, I would say, in some places, to what it used to be. As to the flow of the river being as good on the average for the last ten months as for any ten months I ever knew it, I will say it has been all right since May. I don't know. That would make it twelve months—I think so, since May of last year. We have had an extraordinary rise last fall that we hardly ever knew before, from some cause or other. I don't know. As to whether
7350 the flow in the last ten or twelve months in the Arkansas river has been as good on the average as for any twelve months I ever knew it, I will say, I haven't any way of judging. The river has narrowed up, and you spread it out a third, and what it has been in the ten months it maybe wouldn't be so high. I think it has narrowed up in every place with us. No, I don't know of places along the river where I have been seeing it of late years that it was practically as wide as it ever was. I don't think I remember any such place. I think the river has narrowed here at the bridge in Dodge City in the last ten years. I think so. They used to have an extra span there and they have taken that away. I don't know that they banked in the river and narrowed it up. That island is taken in on the mainland, if I remember right, and

there it has narrowed up, and those trees above show about like our banks do where it is narrowed up with us. Yes, sir, I have
7351 gained some made land that way myself. I don't know about how many acres. No, sir, I didn't help nature in attaching those islands to my mainland. No, sir, I didn't fill in any brush or anything else to help attach it. I did try to but didn't succeed. The river on my side is steep; that is, the banks, and I used to try to form a second bottom there so that my banks would not fill in, but I didn't succeed. As to the man on the other side succeeding, he didn't have anything to do with it. He was the fellow, though, that had the made land. No, I don't think he did help to stop the flow there. I don't know of anybody there particulary that has changed that river. I always found it a hard river to work against. I ditched there for six years in that river and it is just like working on a sand pile. As to why I ditched in the river, I will say, to get the Mulberry over to my crops. I would have the river so dry there that I would just run that Mulberry right across the river. The Mulberry is a little creek on the south side of the river. I don't remember when I ditched the sands of the Arkansas river to get the Mulberry across it. It was about twelve or fourteen or sixteen years ago. The Mulberry comes into the river on
7352 the opposite side from me, and I endeavored to get the water across and we had to run it up the river a little. Yes, sir, I did do it. I just dug a ditch in the sand and threw up the bank. As to whether I was able in that way to catch any water in the river bed, I would say if there came water down the river very much we couldn't control it. Our ditch wasn't big enough. It would wash our dam out when it came down the river very much, yes, sir. The running water in the Mulberry heads about a mile from the Arkansas river, I guess. Yes, sir, and it is a stream that runs constantly all the time the year round, and its supply of water comes out of the sand. As to
7353 whether I have the same theories about the Mulberry as I had about Coon creek in regard to its getting water from the river, I will answer, I may not have it just like the—I think the water forms into a pocket. There is a formation, I think, that holds the water, and it starts in up there some place and it holds the water and runs it out in a bank there at the Mulberry, up about four feet. Yes, sir, I think the water running in the Mulberry comes from the river. Yes, sir, I think it does. The water in the Mulberry coming down to the river from where it heads has about a foot fall, and as to why if this Mulberry water is river water I cross the river to get it and don't get it out of the sands of the river in the same place where the Mulberry gets it, I will say, we don't have our ditch low enough, and then we couldn't get it in quantities enough. Yes, sir, I had been taking water from the river for irrigation before I diverted the Mulberry water. I irrigated hay lands, yes, sir.
7354 As to whether we base our appropriation from the first time we started to take the Mulberry water or from the time we started to take the river water, I will say, I don't remember how we

did state that. Yes, sir, somebody objected to our taking that Mulberry water, and litigation ensued. The man who objected lived there close. He lived on the other side of the river and I was on this side. Yes, sir, he put a dam across the Mulberry and stopped it. Yes, sir, and I tried to make him take it down, and I succeeded. No, sir, not by any judgment of a court. I ran an injunction on him and the court said he would have to take it out. No, sir, that suit was not completed nor tried to a finish. Yes, sir, it is a fact that after this dam was put across the Mulberry creek the water in the Mulberry got up and ran over the top of the dam—just naturally filled it up behind and ran over the top. The dam was about four feet high, I think, and was about half a mile back
7355 from the mouth of the Mulberry, close to it. As to whether that agreed very well with my theory that the water in the Mulberry came from the Arkansas river, I will say, that is all right. As to how the water coming from the Arkansas river succeeded in raising the Mulberry half a mile up at its source four feet higher than its natural course in bringing it through the dam, I will answer, by running in ten or twelve miles above and getting into a formation that wouldn't let it out, and running off in that direction. As to what kind of a formation, I would say, something that wouldn't let water through it, like we have right north of us. As to whether I ever investigated this particular formation that sends this water down ten or twelve miles to the Mulberry, I have investigated formations that would not let water through, and I tried to investigate that one all I could, but couldn't tell any other way than what I told you. The water would run in on both sides of that creek. It appeared to be coming in one way about as well as the other. Of course it was a mystery to all of us.
7356 As to whether the Mulberry got its water just where the balance of this ground water or underflow as you call it came from—the general drainage of the country, the water that comes from the rains on the uplands of the country and is draining toward the river—I have an idea you will find land up the Mulberry there where you will not have to go ten feet back that never was wet in ages. That is my idea about it, yes, sir. As to whether or not the Mulberry draws its water from the general water gathered over the country, I will say, no, sir, there haven't been any rains sometimes for nine months, and that creek runs. Bluff creek down here dried up and that river dried up and the Mulberry ran just the same.

Yes, sir, at the time I ran this ditch across the river to carry the water of the Mulberry across, the river was dry. I don't know how far up it was dry, but it is very likely that when it was dry enough there so that I could dig a ditch across the bed of the river it would be dry on above there so far as a running stream was concerned for ten or fifteen miles. No, sir, there are no streams coming in above there for ten or fifteen miles. I think not. Yes, sir, at the
7357 time the Mulberry was running water the Arkansas river was dry with us, except maybe there was a little underflow.

There was no water on top running. As to my notion being that the dry streams across which we constructed our ditch—the Arkansas river—was the source of supply of the living stream—the Mulberry—from which I drew the water, I will say, it was the living stream of water that ran into my ditch. It wouldn't be running in the river when it was in my ditch. I took it all. Yes, sir, I think the river furnished that supply that was running in the Mulberry.

I thought it was an underflow that was running out there.

7358 Yes, sir, as a matter of fact my investigations so far as they were carried on by myself and my attorney as to Mulberry creek developed in such a way that we abandoned the legal proceedings concerning the waters of that creek.

As to how the level of the water in the river at my place now and for the last ten or twelve months will compare with the level of the water in the earlier days, I will say, of course when the river is flowing like it is now it gets a little higher. In these last floods it has overflowed my bottom twice partially, and when I first came there I never knew it to do that. As to whether I feel that I have some grievance against somebody because the river overflows my bottom lands, I will say I might have if anybody is the cause of it. If Colorado by taking the water out has caused our river to narrow up so that when there comes an ordinary flood or rains like there has been to overflow our bottom lands here then I would think

Colorado is to blame for it. (Objection.) I don't know who

7359 is responsible for it. I was never in Colorado very far. I don't remember how many times my bottom lands have overflowed of late years. As to whether the level of the surface water in the river is as high now and has averaged as high for the last year as it did in the earlier years that I knew the stream, I will say, yes, sir, I think it has averaged—in the last year we have averaged perhaps as much water as we have had. As to whether the level of the water has been up as high, whether it was as wide or not, I will say I don't know. I have thought that that river had cut down at our place. As to whether that is the natural tendency when you narrow a running stream, that it will scour out and dig a deeper

channel, I will say (objection), I don't know as to that. It

7360 appears to me that when we have these floods the river gets fuller. As to whether in my judgment the level of the surface water on the average is as high as it was in the earlier years, I

have no way to answer that question. The river don't stay

7361 at the same height maybe an hour. It is always varying up and down. (Objection.) I saw the river last at my place yesterday evening, and I have seen the water higher than it was yesterday evening in other years, and I have seen it lower. It goes up and down very fast. As to whether the water for the last ten or twelve months has on the average been approximately as high as it was in the earlier years over a like period of time (objection), I will

say, well, sir, I don't see any way to answer that, because the

7362 river is not as wide as it used to be. Now, to say that it was up that high or two-thirds, how am I to get at it? I haven't

been there. Now, that river, as I told you—a man that is used to that river, he will find it one thing today and another to-
7363 morrow. I have worked a ditch at that river to try to irrigate, and I would have to change my dam every day almost.

Q. But you have been very ready to state that on the average or for the last ten years it has not run as much water as in the earlier days. In getting at that didn't you have to take into consideration the depth of the water, the height that it comes up on the bank, the width of the river and all those things, and if you can arrive at that so readily in answering a question by counsel for Kansas, why can't you make me the same approximation as to the average
7364 height—one of the elements? (Objection.)

The COMMISSIONER: Now, Mr. Imel, that question can be answered and counsel is entitled to an answer.

A. Well, how am I to go at the answer? By the way the river was this morning?

The COMMISSIONER: He has asked you the average through the last ten or twelve months. Does the water come as high up on the banks through that period on an average as it did in the earlier years that you knew the river for a like period of time—ten or twelve months?

A. Well, my opinion is that there has about as much water went down the river in the last ten months.

The river being narrower, as he has said, as to whether that has brought the level of it as high up on the bank, I will say,
7365 that is, I mean it would average about as high. As to how deep we went for water when I first settled on that bottom, I will answer, there was part of our bottom that was not more than two feet, and there was part of it five feet and part of it maybe eight or ten feet. As to whether this bottom land had any open wells or anything on it so that I could determine the effect of the river upon the water in those wells, I will say, there were holes. Of course I couldn't have any wells there. But then you could now. The man I bought it of that proved up on the claim had a hole dug there, and that water was only about two feet deep when I went there, and it was there all the time unless the river would get dry, and when the river would get dry, as to what became of the water, I would say, I suppose it settled down in the sand, and when the river came up then the water would rise. As to how far that hole is from the river, I would say that place I am speaking about I don't know how far it would be. About forty rods. As to whether there has been any old channel or slough around through there that shows that the river might have had an old channel there at some time, I will answer, yes, sir, there are channels all through the bottoms, I suppose. It looks as though the river might have been there at
7366 some time. I think the water level under my ground has gone down three or four feet. As to my saying to counsel for Kansas that it was three feet, and as to whether I know that it is three or four feet, I will answer, no, I do not. It is three or four feet. It

is somewhere along there. No, sir, I don't mean to say that in this summer of 1905 the water level underneath the ground is three or four feet lower than it was in the '80's. No, sir, it is not just as high today as it ever was when it is not overflowed. It is not. I have an idea it is just as high now as it was when the river was running at the same stage as it is now. No, sir, in the last ten or twelve months I have had no complaint to make on the level of the ground water. Here lately we have had a complaint to make.

7367 There is too much water. No, sir, we didn't get as good a hay crop last year as we got in the earlier years. As to how I account for that in view of the fact that I attribute the growth of the hay to this underground water when for the last ten or twelve months the water level has been as good as formerly, I will answer, the water had settled down about three or four feet and the grass dried out. I raise wild hay and alfalfa. Alfalfa is the most profitable of the two crops. As to whether when the water gets three or four feet from the surface or five or six feet it is better for alfalfa than when it is nearer the surface, I will say, yes, sir. I have an idea it is better if it is eight or ten feet; that is, for seed, I don't know as far as hay is concerned. Five or six feet is good, I guess. If the water level permanently dropped three or four feet under my land where it was formerly two and six and eight feet, as to whether it would make it more valuable land for alfalfa than it is now for wild hay, I would answer, yes, sir, but we want some wild hay with our alfalfa. As to whether we would not want the wild hay badly enough to raise it if we could raise something more profitable on the ground, I would answer, I don't think we can raise any-

7368 thing more profitable than good hay. As to whether alfalfa is more profitable where it grows well, I will say it is owing to what you want to use it for. I expect an acre of good alfalfa land is worth more than an acre of wild hay land in the market generally. I never sell any, but then I expect it is. I have been obliged to buy for the last few years on account I couldn't raise any hay. Last year it cost me a good deal. Yes, sir, I raise cattle, and part of the time in the early '80's when I went there I was handling as many cattle as I am now and part of the time not so many. Yes, sir, this land had been used for hay land before I got it. I think it had been cut and hauled here to the Government post. That is what they claim. Yes, sir, after I got hold of it I commenced to use it not only to cut hay off it but to pasture it in the winter. We pasture it. Yes, sir, I have been pasturing it for about twenty-three years. As to whether it is a fact that the over-pasturing or

7369 constant pasturing of wild hay land for a long period of years has a tendency to decrease its product and to trample out the original grasses and to give room for weeds which eventually take the place of the grass, I will say no, sir, it is not. As to whether I will say that the pasturing of meadow land right along will not injure the meadow, I will answer, no, sir, not in the winter it will not. Now, we have tried it. We took the cattle off this last winter for the

first time. We tried it for twenty-two or twenty-three years. The reason I took the cattle off last winter was that I seeded it in alfalfa, a part of it, and I had to keep them off the alfalfa. As to whether I took any of them off because I wanted to see if it wouldn't help restore the land to keep them out of there, I will say, I know the land where I had alfalfa, the wild hay wasn't any better than where I pastured it. I know that much. It don't do to pasture your hay land in the summer time nor too late in the summer—in the spring,—but it will not hurt hay land to pasture it in the winter. Yes, sir, I have pastured it too late in the spring or summer. As to whether the land suffers if you do that right along, I will say, you give the weeds a start. But it helps the land. Our land needs trampling. That is my experience. At the city of Ford it will produce twice as much grass as it will—I have a pasture right south of Ford there, part of the town site, where it has not been trampled,
and it don't produce half the pasture it does down town where
7370 it is trampled. It wants to be trampled and grazed or else burned off. I don't know but burning might do. But it appears to me that our buffalo grasses are dieing out on account of not being burned off. I think that is the case. Nearly every year when we first came here before the country was settled and fenced prairie fires at times ran over the country. As to whether that helped keep the little trees killed down along the banks of the river so that there were not nearly as many growing as there are now, I will say, no, sir, that didn't help to do it, because we lived there about ten years before these trees began to grow and the first fire didn't burn down in there—well, it got down in there twice. It didn't go in amongst where the trees would be in there. I know there is men say that, but we have been right there and I have wondered why these trees started up. I have never heard anybody say yet why it is. But it just looked like there came a rise about twelve or fourteen years ago and it just sowed the seed right up and down the river, and there came a rise four or five years ago that did the same thing, and those trees are
growing. I began to plant cottonwood trees on my land in
7371 1878 and 1879; and as to when the settlers began, I will say, well all that was here then, they began—a number of us. As to how old these cottonwoods have to get before they furnish any considerable amount of seed, I don't know. We have one in our yard that has been there for about fifteen to nineteen years, but then we had big cottonwoods up the Mulberry that were two or three feet through, and there were trees there at my place. As to whether there were only a few scattering ones over the country before the settlement as compared with what there are now, I would say, oh, yes, there were very few then as compared with now. I expect a cottonwood tree has to grow twelve or fifteen years before it is big enough to produce any considerable amount of seed. I notice some seeds on that one in the yard. I can't tell. If they commenced to

stock this country with cottonwoods or to plant them along
7372 about 1880 and from that time on, they would be getting just about big enough to furnish the seed for this period of fifteen years ago when I said the little cottonwoods began to spring up along the river. I would expect so. I don't know as to that. The seed could come down the river from Colorado. I don't think the reason that they were not growing here was on account of there not being seed. If the seed had gotten in along the river there and been in the right place I expect there was plenty of opportunity for them to grow. Yes, sir, buffaloes used to run down to the river in great herds, and afterwards the Texas cattle were held up and down this river when Dodge City was a shipping point and helped to trample out all kinds of brush and trees. As to whether I think the buffaloes and cattle had something to do with keeping them down in the earlier days, I would say they didn't after we came, because there at my place the cattle ran in there every year right along the river where the trees are, and we have held them right there, and they are growing just the same as in other places.
7373 Well, I don't know that cattle in bunches that way are not like the big herds that they handled in compact form. They are there every day for four or five or six months. As to whether those cattle feed, as all cattle do, one or two in a group and scattered around, and don't bunch up and travel like two or three thousand head on the trail, it is owing to the weather. If there comes a storm they bunch up. But as to whether they do not then make for the water, I will answer, they will get down in the willows, though.

As to when I first commenced to take an interest in this Kansas-Colorado suit, I would say about the time I began to get interested about it was about the time the water began to go away on us. No, sir, I never went up into Colorado to see whether Colorado was doing anything to affect us below. I don't remember about making any complaint to any citizen. I never made any complaint to the Government about the citizens of Colorado using the water in that State. No, sir, I never commenced any legal proceedings or anything of that kind to stop Colorado or its citizens from con-
7374 structing large and expensive irrigation plants. I was up there one time at Rocky Ford and I noticed they had a good flow of water there and a nice ditch. They just got it out. As to whether I knew from general information and my own observation that Colorado was spending large sums of money, or her citizens, in the construction of plants, I will say, not any more than what I saw there betwixt Catlin and Rocky Ford. I heard a great deal, yes, sir. As to whether I read a great deal, I don't know. I expect I did. I believe so.

Redirect examination.

By Mr. ASHBAUGH:

As to whether good hay land along the river is likely to be good alfalfa land, I will answer, it will if the river keeps going down, but it don't do for us to have our alfalfa too close to the water. Good hay land is not too close to the water either. The best hay land I have that has produced the best hay was perhaps six feet from the water. We have got land, though, that used to be
7375 about two feet that produced rather more in quantity. As to whether there is any difference in the quality of the soil near the river where it is shallower to water than where it is deeper to water, I will say I have got soil that is not very deep to water that is black muck. It looks like it would be all right, but it used to be a little wet. It would be all right, I suppose, if it was dry.

Recross-examination.

By Mr. DAWSON:

As to how the values of land in this county generally along the river bottom compare now with what they have been at any time in the last twenty years, I would say, the value of the land is better, that is, the money value.

Redirect examination.

By Mr. ASHBAUGH:

As to that being true all over the State of Kansas and all over a great many other States, I will answer, all over the county. Now, I sold land that less than a year ago I paid $185 for, and I sold it for $800.

I irrigate my land now only from a windmill. As to how extensively I have irrigated, I will say, we didn't have out a very big ditch. I can't say exactly how much hay and alfalfa we did irrigate. I should think 100 acres anyway, and we worked at
7376 that irrigation about six years and the water gave away on us and we couldn't depend upon it and had to quit.

(Complainant's Exhibit A–54, being a certified copy of the charter of the Alamo Irrigating and Manufacturing Company, offered in evidence; also Complainant's Exhibit A–54½, being an amendment to said charter. Objection.)

LARNED, KANSAS, June 5, 1905.

7379 W. H. JOHNSON, Larned, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live four miles up the river between Larned and Garfield. I live on the north side of the river and between the railroad and the river. I have had my land there for the last thirty-two years, but I moved there myself in 1878, about twenty-seven years
7380 ago. I have known the Arkansas river for the last twenty-seven years, and I had my land there ever since 1873. The railroad was as far as Dodge when I got here. My land runs along the river for two miles, and I have a little over 800 acres, and it extends back about a mile, some of it. My house is about a quarter of a mile back from the river. I have seven wells on my place, all drove wells. I have had no open wells. We would generally dig down to the first water and then drive down. As to what I mean by first water, I will answer, the surface water, what they call—we generally call it from the river—river water. It feeds the ground water underneath. As to why I call it river water, I will say, well, because it is quicksand water and it looks like river water and it is not good
7381 to drink. As to whether the water underneath my land is always at the same height, I will answer, no. As to what changes that height (objection), I will answer, well, I have found it when I have been putting wells down in the same locality—there was one year when I first moved there there was plenty of water in the river generally. That was in 1878. I dug my first well at what I call now my old house there. The house and the well are there yet. I had to go about six feet to first water, and about ten years after I went about thirty feet from the same place. I had a corral right across from my house and it was all river ground and the water had been dry all summer, and I dug six feet and struck no water, and I got into dry sand and had to go three feet farther there to get the water than the first water in the other well. As to whether that is the same kind of sand we found the
7382 water in on the other land, I will answer, yes, sir. As I told my neighbors there, it was because the river was dry. As to whether the level of that first water rises and falls with the condition of the river (objection), I will answer yes, sir, I think it does. As to how far back that condition extends, I will answer, well, there where my well was, a quarter of a mile—a good quarter of a mile. As to whether that condition extends farther back than that (objection), I will answer, well, I don't know. I haven't made any wells farther back, that is, farther north.

As to the average flow of the river outside of floods in the last ten years prior to last year as compared with the flow of the river for the same period of the year during the first years I knew it (objec-

tion), I will say, why, it is very bad for the last fifteen years—
7383 only the last two years—no water in the river at all. Yes, sir, that condition has lasted for about fifteen years prior to last month. As to the river banks being as wide as they were when I first came here (objection), it has damaged me a good deal in the last fifteen years on account of the water being stopped and making the river narrow. Now, it banked up on one place since I have been there for twenty-seven years, and there is about ten feet wide of made land on one side and on the other side—Mr. Lowry is on the other side and it banked up again and it just swept the sand up and banked it up on the other side and that brings the current on my side, and there are no trees there and whenever it banked up and made land it made trees and it made the river in such shape—narrower—that when these floods come it just ruins part of my land. As to there being more sandbars than there were in the river and higher sandbars than when I came here, I will answer, no, I can't say that. It whips it up out of the middle and drives
7384 it on either one side or the other. As to whether there are more or larger islands in the river now than thirty years ago (objection), I will answer, no, sir. As to whether the sandbars have grown over with trees now that were bare thirty years ago, I will answer, not along by me but farther up there is.

Cross-examination.

By Mr. DAWSON:

No, sir, there has not been any water in the river, not in the summer, until two years ago, for the last fifteen years, to amount to anything, unless there were some cloudbursts. As to how my land was flooded if there was not any water in the river for that time, I will say, it was flooded only when those cloudbursts or something came or they had more water in Colorado than they needed. As to how I know that, I would say we generally hear from newspapers that there is a flood coming either at Dodge or Garden City, about five feet or something, and we have to be prepared. Yes, sir, as a matter of fact we have had high water in the river now for a good many weeks. As to whether the water down here has been very
7385 much more than there has been in Colorado in the river for the last six weeks, I don't know that, only the reports in the press or from people coming from there. As to whether even from the reports in the papers or from people coming from there I have not heard anybody say, from Colorado, in the last six weeks that there is as much water in the Arkansas river as there *has* here, I would say, yes, only what I hear. I have not been up there when there were big waters. Those wells I spoke of were a quarter of a mile from the river. Not on the first bottom where my house is. It is on second bottom. I call it first bottom near the river, and the first bottom is about two feet above the water in the river when the river is at an ordinary stage. I mean the water is about two feet

deep. As to how high the first bottom land was above the surface of the water in the river when the river was at an ordinary stage, I would say, it differs. In some places five feet and in some places ten feet. The second bottom is from six to eight feet above
7386 the first bottom, and the second bottom would be about ten or twelve feet above the level of the water in the river at an ordinary stage.

Yes, we struck the water in the wells the first time we dug at six feet, and the next time, in 1888, at about nine feet. Yes, sir, we always thought that was river water. The first few years after we came here—I moved here in 1878 and we had no place fenced, and I had my stock back at * * * and I made two barrels
7387 in the ground, and that was on what we might call the first bottom. Afterward, along in the fall, the river got dry and my water fell in them barrels. The barrels were about a quarter of a mile from the river. Yes, sir, there are some old channels or sloughs around through the bottoms showing where the river had been at some time in the past, years ago. No, not in the early days before I was there. It broke through about—well, I don't know just where it was. As to whether there are any low swales or old channels showing that at some time maybe fifty or a hundred or two hundred years ago there was an old channel there, I would say no, only you might say a little divide, but no regular channel, not on my land. No, sir, no sloughs. Well, a kind of a swale, and it is all grass land, only when the river overflows it would go through this low place. That is a kind of swale, that is all.

The Arkansas river is a kind of alkali water and we don't use that first water to drink, no, sir. The well we sank in 1888
7388 we dug down about six feet to quicksand, to the first water, and then put a point on it and drove it down. No, sir, I didn't say in 1888 we had to dig nine feet to first water. That was six feet, and after that, about five or six years after that, when the river was dry, I made one about thirty feet farther from there for my calves, on the same level of ground, and had to go about three feet farther to water. Yes, sir, I said the first well we dug was in 1878, and we went six feet, and afterwards about ten feet, and back about thirty feet from there we had to go nine feet, yes, sir. Well, I didn't understand you right. Yes, sir, in 1888 we had to go nine feet on that land. I thought you meant 1878 instead of 1888.

Yes, sir, I can see the river from my house. I can see the river plainly. No, sir, there are no islands along there that have become attached to the mainland. As to whether I know of any people up there above me who have helped the islands attach to their mainland so as to get some more land, I will say, I will
7389 take it back. There is one island that used to be in the river that is now attached to the mainland, because, as I said before, the wind blew it out when the wind blowed hard from the south side of the river and the river was dry. It drives all the dirt and the sand and sweeps out in regular clouds between

this island and my ground, and now it is all made land. No, sir, I never put any brush or sticks in there to help fill up the little channel between the island and the mainland. No, sir, I never knew any people above me to do that, and I have not known some people here at Larned to do it. No, sir, I don't know of some 200 acres of land that Mr. Frizell built out here to help nature. (Objection.) No, sir, I didn't know that Mr. Frizell acquired sixty acres on the other side of the river by assisting nature in attaching it to his mainland. (Objection.) I never saw any of Mr. Frizell's land that he made in that way, and I never heard of it either.

7391 S. S. DICKINSON, Larned, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I was born in September, 1837, and I came to Pawnee county in February, 1875, and settled over where I am now living in June, 1876. I am living on lots 2, 3, 4 and 5, in the northeast quarter of section 8, 22–16. That is one mile south of the city of Larned and on the south side of the river. The river runs past my house, almost due north and south. I have 308 acres of land there, according to Government survey—340 acres with the accretions. I came to Kansas on September 20, 1865, and located at Lawrence. I became acquainted with the Arkansas river in the winter of 1867. I was living at Humboldt as United States deputy marshal and
7392 I received a package of papers and orders to go to the mouth of the Little river on the Arkansas river to meet Durfee's men and locate a ranch and cut poles on an island which was represented to be at the mouth of the Little river. Those poles or trees were from a foot to eighteen inches through which we wanted to cut for a stockade. I became acquainted with the location of the Arkansas river and the Little Arkansas river at that time, and I have been acquainted with the Arkansas river from that place up, ever since, yes, sir. For several years, I was there off and on nearly every month, and in later years I haven't been there more than once or twice a year or two or three. Yes, sir, I am somewhat acquainted with Cow creek and Rattlesnake creek and the Pawnee river, and the tributaries of the Arkansas, especially on the south. I am acquainted with Mulberry creek and Crooked creek south from Dodge City in Mead county. Yes, sir, I have been up and down all of
7393 those streams. I have lived continuously on my land over here since 1876. As to crops, I have raised wheat, rye, oats, corn and potatoes and all vegetables grown as well as fruits. As to the extent of my fruit raising, I have over 2,000 bearing apple trees and over 1,000 cherry, plum, peach, pear and other trees, that is, the tame fruits, besides a great deal of wild plums. As to my business all these years, I was a civil engineer when I came to Kansas,

and was in the real estate business when I came here. I have been appointed county surveyor, and was elected in this county for fourteen years. I have been connected with the Santa Fe railroad in the West, in Colorado, under Robinson, as an engineer, and with the Missouri Pacific extension from McCracken west. When I was at it I put in my whole time at engineering. In 1886, 1887 and 1888 that was my business and nothing else. Yes, sir, I have given a good deal of attention to surveying. I was county surveyor here for fourteen years. During that time I was in the real estate business. A Mr. Thomas and myself were the Santa Fe agents
7394 here selling railroad lands from 1876, and I was appointed in the fall and we went together in 1876 up to 1878 selling railroad lands.

Yes, sir, I have had occasion to examine the underflow of the Arkansas river. I think so. As to what called my attention to that fact first (objection), when first starting in on this real estate business our main argument in selling lands was that we didn't need rain in this country, we had the underflow to supply all the moisture needed. (Objection.) Professor Worrel of Topeka, connected with the land department of the Santa Fe system,
7395 came out through here and explained to all agents that the water—the sheet water under—(objection)—I have seen those things in digging wells and digging pits which we all had to do in our first settling up of this country when we supposed we had to have lots of water. We would set barrels, as Mr. Johnson states, down in the ground, one or two barrels, and make sticks to go down in the ground to reach these barrels. The water in the ground when it was full was at the top of these barrels or above them, according to how deep they were down in the ground. Over on my place where I had the first garden I had two of those barrels, thirty inches each, one on top of the other, and when the water was low or scarcely a small stream running in the channel of the river the water would be hardly so that you could get a bucket full. That was used for irrigation and for watering our stock. When the river was high those barrels were full and overflowing. As to how far back from the river I noticed this, I will answer, that was about 70 rods where those barrels were first put in. As to whether I have noticed the influence of the river upon the level of the underflow back farther than
7396 that (objection), I will answer, farther back than that over the ridge there was a cattle camp. The year I came to Larned in 1875 they had a place dug twelve feet deep and carried out the dirt where they had the steps running down to it, and over in what we call Pickle Creek valley that water would rise. I have seen it at the top of the barrels and then again I have seen it when you couldn't dip half a bucket full. As to what caused it to rise and fall in the barrels (objection), well, I have noticed that when the river was high it was high in those barrels and it was low in the barrels when the river was low. As to whether the river would

rise or fall before a corresponding rise in the barrels (objection), I will answer, following the rise in the river it would rise in those
7397 barrels. When the river would fall it would fall in those barrels. As to what called my attention to the fact that this underflow had a current (objection), I will answer, in several instances. When the Santa Fe dug this well right here in town they had a centrifugal pump—— The Santa Fe well in the city of Larned is about half a mile straight north back from the river, on the north side of the river. That well is 16 feet in diameter, I think.

Continuing my answer: In digging that well they kept part of the time a donkey engine pumping it and part of the time horse power. As they got down deeper they had to put a steam pump into it. The horses couldn't raise the water. They had too large a pump. As the water would come in and fill up to the level of that water you could drop a little stick onto the upper side and it would glide right across to the upper side when the water passed out. As to what I mean by the upper side, on the upper side—toward the upper side of the stream—toward the southwest. The river runs from southwest to northeast here in this section of the country. The direction of this current across this well was
7398 almost equal to the direction of the river and was parallel with the river. Yes, sir, I have had occasion to notice a current to the underflow there and at other places. Over on my other place I had occasion one time to bury a dead animal. It was a low place, and the men in digging and covering it up worked on the north side out of the stench, and they dug a trench ten or twelve feet long and about three feet deep to cover it up. It was near the road, nearly a mile from the river. Five or six years ago this spring the secretary of the horticultural society at Topeka was at my house here and we were talking about the underflow, and it was something he never had heard of or seen, he said. He didn't know what it was. I was trying to explain it to him, and I said "By the way, the river has raised last night and probably I can show you what I mean by it." We walked through the orchard and so on out to where this trench was dug. I told him there I had seen the water flowing through that and we would go and see. The water had raised the day before, probably thirty hours previous to our
7399 going out there—twenty hours—and we walked out to this place, and when we got there there was water in it, standing. We stood there talking about it, and we could see the water rising, and he says "Look at that, the water is all coming into it at this end—into the west end (objection)—." Well, that is what I saw myself, but he called my attention to that. And while we stood there I placed a stick in it. We stayed there and timed it for half an hour and it raised two inches in that hole, and he says it is raising up there, and I says there is a current. I was chewing tobacco and spit tobacco juice into it and we could see it pass from the west end, up the stream, down to the lower end and out of sight. We stayed there until that water raised two inches in the stream. As to

whether there was any wind that could have blown the tobacco spittle across that water, I will answer, no, sir, there was not. It was very calm. As to what was the cause of that (objection), I will answer the rise in the river was forcing the water out there,
7400 naturally, down hill. That was just about a mile back from the river. As to how far back the river influences the level of the underflow (objection), I will answer, there is no limit as long as it is down hill. As to how far I observed its effect upon the underflow (objection), I will answer, nearly twenty miles. As to the level of the underflow being affected to any appreciable extent by a rain in this part of the country, I will answer, I can't say that it is. I have never seen it raised through a rainfall, unless the water in the river rises. I have seen rains that raised the water in the river and that would raise the underflow. As to whether the underflow goes back at least as far as the width of the valley of the
7401 Arkansas river (objection), I will answer, yes, sir, to the foothills. If it was not we should not have the springs between the creek and the Arkansas river. They would naturally be on the other side. As to whether the Arkansas river acts as a sort of a stand-pipe for determining the level of the underflow back through the valley (objection), I will answer, yes, sir, it does. The Arkansas river is higher than the valleys on either side north and south parallel or square with the river, at corresponding points, yes, sir. Now, like the Rattlesnake over here, it is much lower than we are at Larned, and the water in the river forcing what is below out, it makes the underflow passing down through there at times. That shows there are good, big springs breaking out along the Rattlesnake from twelve to eighteen miles away from the river. Those points are lower than the points parallel at the river at corresponding points to the
7402 river, yes, sir. As to which side of the Rattlesnake those springs are on, I will say, I found several on the north side of the Rattlesnake, good springs, springs that would fill a five-inch stove-pipe—the waste water from them. Yes, sir, the Rattlesnake runs to the northeast and these springs are on the north side of what might be called the north and west side, yes, sir. As to whether I ever found any of those springs on the south and east side (objection), I will answer, I never found them on the south side. As to whether that is true all along the course of the Rattlesnake, I will answer, I have been over near the head of it, almost due south of Kinsley, about twelve miles below St. John, well, to the marsh, and that is true throughout that distance. I was holding cattle there. The cattle were owned by parties in Chicago, and through some legal arrangements they were placed in the hands of a receiver and were in my charge. I was not here much of time, and I
7403 went down and saw those cattle. The river was dry. The river kept drying up from these ponds down just above St. John, and we appeared to be almost out. There were water holes. I came back from the west and the river had raised in twenty-four hours prior to my coming home, and I took the horses and went down

there and went to work and they had plenty of water. The water had come in and raised. And I went down to our ground—the ranch was owned by the parties—and the water had come in there. That was at night, and next morning the water was coming in there. That was in line with the Rattlesnake, from the head of it and down there fully twenty-five miles away from the river. There had been no rain to produce that, no, sir. The whole valley of the Rattlesnake is lower than the corresponding parts of the valley of the Arkansas river. Yes, sir, that is true of the bed of Cow creek. That is true of the bed of Coon creek also. Yes, sir, that is true of the Pawnee river and of the tributaries that enter the Pawnee from the south. They are all fed by springs that—and all of those springs are on the south side of the stream as you get above Dodge or as you get in Hodgeman county to the west.

7404 If any of those streams should be running north and away from the Arkansas river, the springs then are on the west side of the streams, running north, and if the streams are running east and practically parallel with the Arkansas river, then the springs are on the south side of those streams. As to how that is at Cow creek, on which side of it the springs are, I will answer, well, I never saw only one, and that is just above Lyons, on the west side or on the south side. Just above Lyons there is a spring on the south side. As to the Little Arkansas river, there are springs up where I got some timber when I was putting in a bridge at my homestead, and those were on the south side. As to whether I ever saw a spring on the north side or east side of the Little Arkansas river, I will answer, well, I never was to any up in there. That is the only time we were up there, hunting some tall timber, and we found this spring. This was in 1873.

7405 As to how deep in the valley of the Arkansas river we go to find water, I will answer, I think there is no bottom. No, sir, so far as my observation has gone in digging wells we have never gone through that water. It may be hundreds of feet deep, yes, sir. As to where all this water that fills the Arkansas valley comes from, I would answer, well, sir, it comes from the mountains, from the hills, and the rains sometimes. From the upland country, yes, sir, also. (Objection.) As to where the serviceable part of the underflow back at least as far as the foothills comes from or what affects or creates or produces the serviceable part of the underflow in the Arkansas valley (objection), the serviceable part of the water

7406 is that which we can reach with the roots of our trees or grass or grain that we have growing, and that rises near the surface so that those things get it. It is not the rains when the ground is extremely dry. That helps the surface roots but doesn't penetrate only just the surface. It is the underflow that is lower that is rising all the time, bringing that water up to us. As to what affects that and determines the level of that serviceable part of the underflow (objection), I will answer it is the pressure of the water from the "stand-pipe" on the veins or courses which—or the water level

which this water is in. As to what I call the stand-pipe, I say the stand-pipe is the elevation above us of the water in the Arkansas river which is forcing the water out through the levels, reaching to the foothills on either side. As to what then determines the level of the underflow in the Arkansas valley, that is, the serviceable part (objection), I will answer, it is the steady stream of water
7407 in the river that does it. As to whether that is determined by rainfall on the uplands to any appreciable extent (objection), I will answer, it is not. As to what facts I have observed that lead me to that conclusion (objection), I will answer, well, sir, I have made it a study and have been interested in it a good deal. I live on the banks of the river and have been overflowed once or twice, even this spring and last fall. That rain up at Trinidad washed everything out and came down and gave me a dose. The spring rains in the same way gave me another dose, and when I came to this country our whole theory was that the underflow was what we had to depend on and the nearer we could keep it to the surface and the roots of our trees, etc., the better success we had. Three years ago when I had a big crop of apples in my orchard, the trees full and breaking down with them, you could go out in the bed of the river and the surface of the river was perfectly dry for miles
7408 above me, and you could dig down from one to three feet before you could find damp gravel or sand in the river bed. There was a friend of mine here going up there to Hamilton county and I asked him to go up to what we call the rocks and see whether there was any clear running water at the rocks. And he reported that it was dry. (Objection. Motion.) Well, it was dry until there was a rush of water came down very late. I don't know what was the cause of it. And then my apples filled out nicely, but they were small, for the want of water. As to whether the surface of the underflow under my land depends upon the condition of the water in the river (objection), I will answer, yes, sir, it does. As to whether it depends upon rainfall on the uplands to any extent appreciable or useful (objection), I will answer, no, sir.

The average rainfall in this part of the State is about twenty-one inches. As to whether I have noticed any change in the
7409 river bed since I have been here (objection), I will answer, yes, sir. When I settled on my place across the river, I have a mile of river front on my homestead and along that bank on either side the river is from—well, nearly a hundred rods wide. There was not a cottonwood or willow large enough to switch a dog, and nothing only skunk brush. There was a kind of spice brush or skunk brush along the banks that might have been three feet high. There were no signs of timber, except down below me. When I first came here there was one old tree cut down, fully four feet through at the butt and some sixty or seventy feet long. The limbs were cut off and gone. There is today, and was at the time,—well, there is two or three trees standing over about a mile southeast of town here, cottonwoods, that are about three and a half feet

through—at that time about two and a half feet—and there were five or six more that had been cut down. These were all the trees in the country in sight from the hill and this town site. Looking up and down, there was not a willow or switch along the stream as far as you could see either way. It was just perfectly bare sand, like my homestead, a good deal of it, was bare sand. And as the river went dry the cottonwood seed began to gather and grow, and today west of my house in the river there is over twenty-five acres of islands formed, some with cottonwood trees on, some of them eighteen or twenty inches through. They have all grown since I settled there on the place—all grown since 1881 or 1882.

7410 As to whether there are any other changes that I have noticed in the river bed, I will answer, as the gentleman made a remark about filling the river and a man that had a claim (objection)—was filling in some of the islands along his bank with some hay and made the islands come to his mainland, the same as where I join the river, at the upper end somebody along above me filled in along the bank and now I have fifteen or twenty acres of good timber accretion running up the river. The river bed is only about two-thirds as wide as it was—about 50 or 60 rods wide now. As to how deep it is compared with what it used to be, I will say, I

7411 think it is about the same depth, yes, sir. The banks are four or five or six feet high along by me, but, narrowing the channel, by putting that volume of water down, it will overflow, except where I have levees up.

As to the average flow of the river for the last ten or twelve years prior to 1904, exclusive of floods, compared with the average flow of the river during the same seasons in the earlier years (objection), I will answer, well, it don't compare at all because in the earlier years we had plenty of water—water running in the river the year round—and a good many floods as well, and in 1885 or 1886 or 1887, along there, a little ditch was put in between here and Garfield, and from 1887 there was no water in that ditch. There had been no water to go into that ditch excepting when the flood would come down. As to whether the average flow of the river has been materially less during the last twelve years prior to 1904, I will say, yes, in-

7412 deed. (Objection). As to what caused the narrowing of the river, the growing of these islands and the covering of these islands with cottonwoods and willows, I will answer, there was no water to carry the trash out of the river that would accumulate. The weeds would grow, the grass would grow, and there was no water to kill it like here this last fall, and there was a dry time—well, the water went down in the summer and a lot of cottonwood seed fell on the bars, and the river was soon covered with young cottonwood trees six to eighteen inches high, and when that rush of water came down from Trinidad last fall it cleaned all those bars out clean. Today you can't find a single switch of those cottonwoods in there on those bars. They were totally wiped out. And the flood this spring, that came down where we had been cutting the timber on

those islands and trying to get rid of them, and it has washed out two islands there on me in the last two weeks, one with two or three acres and one with I should say five acres, and they are nearly all gone. In one case the stumps are standing there and partly tipped over now.

As to about what time this loss of water occurred, outside of floods, I will answer, well, from 1886, 1887 and 1888, along in there, up to two or three years ago. The past two years we have had, with the rains and water in the river, good conditions for the
7413 growing of crops. As to what I mean by two years ago, I mean the year 1904 and a part of 1903. As to whether there was any water in the river in the fall of 1903, I will say, it came down a little late. It was not running. As to how far the water has been in the year 1905, I will say the water in 1904 didn't stop running, and it has been high water all of 1905 so far. As to how I explain that in the early years there were no cottonwoods growing in the river bed and in later years there have been, I will answer, the water kept all vegetation out of the river. There were no bars, or but very little, at a time, and a very small part of the time, in the earlier years when I settled in here, but the whole bed of the river was covered with water. As to whether there was sufficient cottonwoods in the early years in this country to have furnished cottonwood seed if there had been a place for it to grow (objection), I will answer, yes, sir, there was, because I have cottonwoods on my place that seeded from those big trees that are now growing over there and that are over two and a half feet through that have sprung up along the bank where they had caught on the high bank of the river and grew. As to how I explain the loss of
7414 water in the river that I have described, why, it was all taken out up in Colorado. As to whether or not the loss of water occurred immediately after the appropriation of water for irrigation purposes in Colorado and continued to increase as they continued to increase their appropriation (objection), I will answer, yes, sir. I have seen those ditches at Las Animas and Lamar,—well, a ditch on the north side and west from Las Animas—taking the water—the Fort Lyon ditch, yes, sir,—taking the water there when I would come home here and find our river dry and there was plenty of water up there. Under those same conditions years before there was plenty of water in the river here. As to what effect the taking of water which I have described and the loss of water in the river during the last fifteen years has had upon the productiveness of the lands along the Arkansas river and upon my own
7415 lands, and especially my own orchards (objection), I will answer, well, sir, as to growing crops—hay crops—on my land, which is bottom land, in the earlier years it ran from three-quarters of a ton to a ton and a half on the acre, on an average. After the dry years came, from 1886 or 1887 up, why, if we got one-quarter or one-half of a ton to the acre it was all we got, and a good deal of that bottom land has been plowed up and put into alfalfa, which

prior to that time was too wet for alfalfa land. I had in alfalfa and when the overflow came it filled it all up and was standing on it. My land was a little too low. Now, this last year my crop of hay was nearly one ton to the acre on this same land that has been giving me a quarter of a ton, because we have had plenty of sub-irrigation. The water in the river has been up continuously, and the crops at this time—wheat and corn—are in the same way.

7416 About the orchards this last year, there was no lack of water, and everything got its full growth and didn't take its second growth, for want of water, while a great many times these orchards, where they are in the bottom—it will make a four-inch growth, or whatever it is, and when the water goes out in July and August they dry, they make a mature bud, and as the rains come in September again they will start a good new growth of half an inch to two inches—the fruit trees—and of course that makes bad buds. As to what would be the result and effect on the Arkansas valley if the surplus waters of the Arkansas river were impounded in the State of Colorado, or in western Kansas if reservoir sites could be found, and the normal river below that undisturbed but the surplus waters applied to irrigation in Colorado and Kansas (objection), I will

7417 answer, it would make the richest valley in the world. As to why I say that, because we can beat the world raising crops when we have just the right stage of water, and when the underflow comes up and gives us moisture as wanted we can beat the world raising crops—corn, wheat, and all kinds. As to whether that would equalize the flow so as to relieve the flood situation and yet retain the underflow as it should be for a higher development of the Arkansas valley, I will answer, yes, sir.

Cross-examination.

By Mr. DAWSON:

I first saw the Arkansas river in January or February, 1867. I was there about a week or ten days at that time, I guess, with the boys. There was probably two feet of water in the Arkansas river then. That was below the mouth of the Little Arkansas river. It was not as deep above the mouth of the Little Arkansas river.

7418 The river was freezing over at that time. As to whether it is a fact that below the mouth of the Little Arkansas river in the winter of 1867 there was very little water, if any, running in the Arkansas river proper, I will say, no, there was water in there. Yes, sir, there was running water. There was ice there. Well, as to its being a large or small amount I couldn't say. I went to find a man up there that I was directed to find, Doctor Llewellyn, who was up with the Indians about four or five miles west of where the Little river is. They were camped up there and he was up there trading.

Yes, sir, I saw the river in the summer and fall of 1868 at Wichita, and as to whether it was practically dry at that time above

the mouth of the Little river, I couldn't say. I saw it there at Wichita, and that is below the mouth of the Little river. Yes, sir, I saw the Little river at that time. As to whether there was any more water flowing in the Arkansas river below the mouth of the Little river than I saw in the Little river itself, I couldn't say. I didn't measure it. But there was water in it, because we
7419 crossed it going and looking up bunches of cattle and getting cattle at that time. I was handling cattle then.

Yes, sir, I saw the river again in 1869. I was there. As to the flow at that time I couldn't say. I don't know that I saw the river in 1874. I saw it in 1873 in the spring. No, sir, I don't think I did see it in the grasshopper year. That was in 1874 the grasshoppers came. No, I don't think so. I was living at Humboldt then. Yes, I came over again to the river in 1875. No, sir, I didn't learn by general repute at that time that the river had been dry in 1874 and no water flowed in it for many miles. I didn't learn anything about it.

In 1875 when I saw the river I was living right here on the bank of it then and there were from six inches to three or four feet of water in it, and in 1876 it was about the same. In 1877 it
7420 was dry about sixty days in the summer and fall of that year. In 1878 I lived right on the bank of the river then and there was water in the river.

As to what effect the sixty days of dry weather in the river in 1877 had upon my crops, I can't say that I noticed any discrepancy in the crops, and I didn't notice what effect, if any, it had upon the level of what I call the underflow, no, sir. As to how I happen to have overlooked it at that time, I will answer, I might have seen it and I might not.

In 1879 there was a fair stage of water; and coming to the year 1880, as to whether it is a fact that during a part of the summer and fall of that year the river was practically if not entirely dry except for water in holes, I would say, yes, sir, from along in August
7421 or September until in the early winter. That is right. As to whether that had any effect upon my crops or any effect on the level of what I call the underflow, I would answer, it had no effect on the crops, because they were all matured. As to its having any effect on my trees, I had but few trees out at that time. As to its having any effect on the level of the ground water or what I designate as the underflow, I would say yes, sir. I noticed that in my wells, because my wells there at the house are all drove wells, but I had to go down in the ground from four to six feet and curb it up so as to put a cylinder down there where it don't freeze, and of course the water would rise in those wells when it rose in the river. I put those in in dry times. As to my saying "Of course it does," as a matter of fact it does. Yes, sir, it does. Those wells are covered over at the top. And as to how often I was in the habit of going and removing the top to determine whether the surface of the water which I didn't use raised or fell in the well, I will answer, the well

at the house we had curbed up six or eight feet and we used it as a cellar and have been using it all the time. It was curbed up
7422 and enclosed, and we used that to set butter and milk and stuff in it. We had no cellar under the house. During the years 1878, 1879, 1880, 1881, 1882 and 1883 we used that place for a kind of cellar. That was about twenty-five rods from the river and on the first bottom. The first bottom there at a moderate stage of the water is about level with the banks of the river, and the banks are about seven or eight feet high, and at a high stage of the water the water is within two feet of the top of the banks and would come within about three feet of the top of the well. As to what system I adopted when the river was at that height for setting the butter and stuff in this well, I would say we had shelves around. Yes, sir, we had a
7423 series of shelves higher and lower, and sometimes it was set on the brick in the bottom, and as the water came in we would set it on the shelf, about eighteen inches and more than eighteen inches above that. As to whether we had to keep pretty close track of it to see that the water did not rise over the crocks or whatever we had the milk and stuff in and get into them, I will say, no, sir, I don't think so. Sometimes my folks would neglect it and the water would rise and run over them. Yes, sir, that was sometimes the case. As to how long it would take for it to rise six or eight inches after the river would get up, I would say, within six or eight hours from the rise of the river passing my place the water would come up in the well. Yes, sir, after it started in on a rise in the evening my stuff was apt to be drowned out before morning. It has done that several times. I have seen over two feet of water come in during the night when it was dry when we went to bed, and there was over two feet of water there when we went to get stuff for breakfast.

As to my ever having made any investigations either of authorities on the subject, or myself, as to how fast that water travels through the ground underneath the surface of the soil, I will say, yes, sir. At the time this well was dug over here I spent two hours
7424 there noting that, and I tried to—— As to whether I was noting how fast it travelled after it got in the open and not underground, well, that is as near as I could hunt it up. As to my knowing as a matter of fact that investigators like Professor Slichter, who is in the employ or has been in the employ of the United States Government and has given some sixteen years to the subject, and Professor Carpenter of Colorado, also of the United States experiment station there, have determined that through ordinary sand and gravel water travels only at the rate of ten to a maximum of about sixteen feet per day of twenty-four hours (objection), I have heard that, yes, sir, but I don't think it is true. Yes, sir, I have made investigations myself of the underground movement of water which leads me to dispute their conclusions. I have dug a hole about where I thought

the current would come, about ten rods away from the hole I have been referring to, and I went and colored the water—I put in some coloring—and about ten rods in one hour I got that
7425 coloring. I used aniline dyes. No, sir, I don't know as a matter of fact that aniline dyes will lose their color in going through that distance of ground, and as to knowing that they will not, I do not. As to what my purpose was in making this investigation of which I have just spoken, I will answer, in talking with Mr. Barnes—this was the secretary—and at the time we were looking at this water, he held his watch and we colored the water at that time—he had something in his pocket to color it—and we took the colors that ran through this open space of 12 feet. He was timing it and he thought it would be a mile there in a week or ten days. I told him I thought it would go quicker than that. Barnes is secretary of the horticultural society in Topeka. He was here at my place investigating the orchards, and hence we were making this investigation. As to the time when I tried this aniline dye, I will say, that was five or six years ago this spring when Mr. Barnes was here, and that was over on my place. He came there to in-
7426 vestigate orchards. His reasons for doing so was, he was secretary of the horticultural society and he wanted to know in regard to some qualities of fruit and the blossoming time and their fertilization. As to what coloring we put in the water, I will say, I used the coloring after he had gone. No, I didn't use any while he was there. He had some coloring in his pocket that he used to note the time that it went through this open space that I had reference to in my burying of the animal. Yes, sir, in that open space I said that I spit tobacco juice into it, but he had some stuff afterwards that he put in there from his pocket. I don't know what it was. The stuff was red, and he put that in and it went down through and he timed it. As to that being what I used later, I will say, I used red and blue and some yellow. No, sir, I didn't get the coloring from him. I bought it here in town. As to which carried the best—the red, the blue or the yellow—I think the blue did. (Objection.) As to whether I put them all in at once or several times, I will say, oh, no, sir. As to how long I was conducting these investigations, I will
7427 say about two days we were fooling over there, my folks said, and my purpose was to see how fast the water ran. As to the reason I wanted to know that, well, sir, as a civil engineer I like to know things positively. As to how long it had been since I had been engaged in civil engineering when I made these experiments, well, since 1889, when I was employed by the Santa Fe Railroad Company, and since that time I have not been engaged in that business. I sold all my instruments and quit. As to whether during the time I was engaged in civil engineering I ever conducted such an experiment, I will say, I have been working on irrigating ditches, yes, sir. No, sir, I never used any dyes to run through the ground to see the movement of the underground water while I was

civil engineer and engaged actively in that business. I did not. No, sir, I had no other purpose in trying those dyes.

As to how the value of my land over there compares now with what it was in the past as to being worth more in the market, I will say, it is worth more. No, sir, I have never known a time when it was worth any more on the market than it is now. Land
7428 values are higher here than they ever were. Alfalfa is a more productive crop, in dollars and cents, than wild hay. Good alfalfa land is worth more than wild hay land.

As to when I first began to take an interest in the Kansas-Colorado suit, I think it was when that gentleman from Colorado came down and called me over to the hotel at Larned last fall some time. I guess Mr. Mellville was his name. No, sir, I hadn't followed the case any before that time. As to whether I have taken sufficient interest in the case to note what was going on in Colorado in the way of irrigation development, I will say, when I was out there I was noticing what was being developed and how. I was there in 1886, 1887 and 1888, and during those years I saw those ditches I have spoken of heretofore. Yes, sir, and at this same time I owned these lands along the Arkansas river. Yes, sir, and I noticed at that time or shortly afterwards that there was a falling off in the
7429 flow of the river. As to whether at that time or ever thereafter I complained to anybody in Colorado or to any department of the National Government or to anyone else in authority or to any ditch or reservoir owners in Colorado that my lands were being injured by the recent construction of irrigation plants in Colorado, I will say, yes, sir, I complained to a lot of Colorado folks. I couldn't give you their names. They were engaged in growing melons at Rocky Ford and they were going down to Topeka, I think, at the time I was going down there to a horticultural meeting, and I was giving them fits about taking the water out and ruining me. My crops were very poor and short, because it was so dry that year and they took all the water to raise fine melons, which they did. No, sir, at the same time they were not taking out water in western Kansas. That was only seven years ago and there was no water in Kansas to be taken out. Yes, sir, there were ditches existing in western Kansas at that time. As I say, that was only about eight or nine years ago. No, sir, I didn't follow up this talk that I had
7430 with these parties on the train by commencing any sort of proceedings, legal or otherwise, for the purpose of stopping the citizens of Colorado from appropriating the waters. I didn't have any money to do that with. As to whether I joined in bringing about the suit of the State of Kansas against the State of Colorado in any way, I think there was a petition gotten up at one time that I signed for that purpose. No, sir, I never contributed anything for the bringing of it. As to whether I ever helped to agitate or stir it up, I have done some talking about it sometimes when I felt that way. No, sir, I never attended any meetings which have been held by the citizens of Kansas for the purpose of arranging for litigation. I have not.

As to whether I have ever known the Arkansas river to have a better average flow in it for a period of ten or twelve months than it has today and has had for the last ten or twelve months, it has been just about equal with the first year or two or three I was here. No, sir, no better. It was about equal to the flow of 1875, 1876, 1877 and along there. As to whether it is not a little better than the flow of 1877, I will say, that is the time I speak of that
7431 it went dry. On the 4th day of July we had a tub race down here in the Pawnee and we went over to the Arkansas and the water was clear and half way across under the bridge there was from three to four inches of water running. One week from that time that stream was just as dry as it could be for sixty days, and then she came down with a flood rolling about two feet deep. There had been no rains in Kansas. No, the river has not been dry for sixty days or any number of days in the last ten or twelve months. Yes, the flow for the last ten or twelve months would be better than in 1877, 1875, 1876 and so on. As to whether or not it is a fact that this has always been a very peculiar river and at one time would not have a great deal of water in it and very shortly it might have none, and as to whether that was true before irrigation was practiced to any extent in Colorado, I will answer, yes, sir, that was the fact before irrigation was taken out. Yes, sir, I have spoken of the Rattlesnake and certain other creeks or streams that from my testimony I said drew a certain amount of water from the Arkansas river, and the Arkansas river is a feeder for them, yes, sir.
7432 They do all finally again empty into the Arkansas river, yes, sir. Yes, sir, it is a fact that between the Arkansas river and everyone of these streams there is a divide or ridge, and still I think the Arkansas river is the feeder of these streams.

As to whether I know as a matter of general knowledge or in any other way that as one leaves the Arkansas river to cross any one of these ridges to any one of the streams I have mentioned, the level of the ground water rises from the river as you approach the summit of the divide and then drops again from the divide to whatever stream may be on the other side, I will answer, in some cases you are right, in others you are wrong. No, sir, I have never sunk any wells across over the Arkansas river in a line to any one of these streams and run my instruments for the purpose of determining the level of the water in the wells with reference to the level of the water in the river. I have not. As to why I say
7433 you are wrong, it is for this reason: The water in coming out of the river, in the river forcing the water out, it don't run squarely away from the river; it runs away and parallel with the river; and if there is a divide right between, no difference how it runs to get to that other stream, as to whether it has either got to go under or over the divide, I will say, that is right. And if it appears from the actual levels run and wells sunk that as you cross these divides the level of the water under the divides is higher than the level of the water, in the river, as to how I account for it get-

ting across, I will say it is not higher where the water comes out of the river to get to this point. I took a point on this divide out south when we were surveying through there and we were talking about the water in the well and he wanted to know why it was that the water in his well was so much nearer the surface than in the well half a mile south of him when their land was just equally level. I told him there was a ridge between, and that to follow his line to the river—here is the water (indicating), the river ran off here, and to follow it out and it would show the difference. I says, You take a line southwest until we strike the river and the water is four to six feet higher than the surface of the ground here. He said no. We fooled away the afternoon in running a level through and found it to be the fact. Yes, sir, what I mean is that if one

7434 will go far enough up the river he will always find some place in the river that will be high enough to get it as high as is wanted in order to get it over the ridge. I was with a Santa Fe man three years ago here this winter. He came to my place and he wanted to know if any of us could find where there was pure water, and I told him I would take him out to where the water was analyzed and claimed to be pretty nearly pure, out here toward Pickle creek. In sinking a well down sixteen feet they got water. They went down then to thirty-eight feet and got pretty good water. He thought he would go down to sixty feet. But the water didn't suit him when he got down there and he kept on going down and pretty soon he got into some stuff that wouldn't give him any water at all. But he got down 140 feet and got pure water, and he took that water back to Rock Island where he came from and had it analyzed. I went out there with that man to find it. He says "Where does this water come from?" I says "If you will go down to Larned you will find in the same places water at 80 or 90 feet."

Yes, sir, I think that water came from the river that he

7435 found. I do. As to where the intermediate water came from, there is this water all the time filtering through, and if a man has ever studied geology he will find out that in running the levels the gravel will run out at certain places. The water runs into that and of course it goes into these levels and carries through. The surface water carries a great deal of alkali, in the first sand or gravel; then we strike a stratum of clay. I have seen it at only two inches, and from there under that you will find very fine sand until you get down to—well, as he says, about six or eight feet he finds water, and then he goes about eight or nine feet down there until he strikes this clay and gets below that and strikes another stratum, and goes on down about thirty feet where he gets on top of another stratum of clay; he goes through that and he gets better water, deeper. You take it in the wells of this town today, at 80 or 90 feet, they get better water. They get four strata here before they get to it, and they get a stratum that the water does not go through, yes, sir. As to whether I think each stratum of water comes from the river, I will say, yes, sir, then they are liable to come from the

river. It filters through that clay. No, you get no water in the clay, because that clay don't carry the water. The water filters
7436 through it. No, sir, it is not impervious to water. This clay is different from gumbo. I have seen gumbo hold water a good while. As to whether this river supplies these various strata so that up to date in my testimony we have got one stratum down 140 odd feet that this man found, I will say, yes, sir, and that was about five miles from the river, and there was a divide between that point and the river. And as to how high the divide was, Mr. Kennedy's well is 120 feet, on top of that divide. As to how far on each side of the river I say the river supplies this that I call an overflow in these various strata, I will say, until you strike the foothills. As to whether it went under the foothills in getting on the other side of this divide, I will say, there are no foothills off to the south and east here. There is a very small divide, yes, sir. As to how far in my judgment this river supplies the water on each side, I
7437 will answer, in places here you can come to the Arkansas valley straight south—well, that is not running parallel with the river. Well, straight south, that would strike up into that divide running south of Dodge, running in toward the Medicine country; it runs in to the foothills of that divide. That would be south of the Rattlesnake and about ten to fifteen miles toward the head of it. As to how far from the Arkansas river, I would say, commencing with the divide it is just south of Dodge three or four miles to it. As to how far from the Arkansas river this underflow which I said is supplied by the river extends, I will answer, to the foothills. As to how far that is, well, commencing at Dodge it is six or eight miles wide, and it holds east until it gets down here opposite Ellinwood and Sterling where it is eighty miles wide. I think under that is an underflow supplied by the Arkansas river. As to how deep up and down I think one can find water supplied by the Arkansas river, I will say, that is according to the strata that you get in to find water. In some places it is as much as a hundred feet, or if you go deeper you will find it, but in one well down here at 740 feet we get down into the salt water at that depth.
7438 Yes, sir, that underflow I spoke of extends under divides and small hills and beyond them into other depressions, because this: There is no hard land—what we call hard land. I mean by that clay, gravel and what is known as hard land, within this limit of which I speak. It is alluvial soil—that is, sandy, gravelly loam. As to where this water that supplies this surface flow and this vast area of underground water comes from, I will say, the Arkansas river is the stand-pipe for it. It comes from the snows and waters of the mountains generally, and the rainfall running into the river. As to whether the rainfall in this country through Kansas has very little effect on this ground water, I would say, you would not have thought so the other day if you had seen the Pawnee up. As to my telling counsel for Kansas in my answer that the rainfall had practically no effect in raising the level of the underflow, I

would say, yes, sir, I did, and I say it now. And that being true, practically all of this water flowing under the ground that we call the underflow and a good part of the surface flow in my judgment comes from Colorado, yes, sir, comes from the snows and
7439 rains in Colorado. I have not been up to the Royal Gorge where the Arkansas river leaves the hills or mountains. I haven't been beyond Pueblo. As to whether I have a notion as to the volume of this great underflow I have described so that I could give you an idea as to how deep it would make the water in the Royal Gorge where the perpendicular granite walls are in places not to exceed sixty to seventy-five feet apart and the bed of the river is absolutely impervious granite, as to whether that would be a pretty big river, I would say, they don't all come through that same hole; and as to whether I know as a matter of fact that the main Arkansas river comes through there and that the streams that supply it in Colorado east of there are practically none of them perennial streams and none of them more than what might be called creeks, I will say, they are pretty good creeks, some of them. I have seen it in dry times. As to whether I would call the Purgatoire a good stream in dry times, I will answer, I never saw it but what there was a pretty good stream there, and I have seen it fifty
7440 times. As to it being true that a large part of the time it flows absolutely no water on the surface, I don't know, I never saw it when it was that way. No, I never saw it at the flood time when it was flowing more than one or two cubic feet per second of time. No, sir, I don't know what the respective drainage areas of the Arkansas river are in Colorado and Kansas. I do not. If it be a fact that the drainage area of the river in Kansas is almost if not quite as much as it is in Colorado and the average rainfall is greater, as to how I would attribute practically all of this water supplying the underflow to the run-off from Colorado and none of it to the run-off from Kansas, I will say, no, sir, I do not pretend to claim it all comes from Colorado. Yes, sir, I say the larger portion of it does. No, sir, I don't know as a matter of general knowledge that the annual rainfall is greater in Kansas than Colorado. If
7441 it be a fact that the annual precipitation is greater in Kansas than in Colorado and the drainage area of the stream in the two States is practically the same, as to whether that would change my notions any as to where the principal part of this underflow as I call it or the surface flow in the stream comes from, I will say, no, sir.

In regard to all of the instances with which I am familiar where the citizens of Kansas in my neighborhood have assisted nature in attaching sandbars and islands to the mainland, I will say, it is the case right across opposite me. Mr. Seeley ran the hotel here and he sent his man out with a load of manure to put into those little islands on the west side of the bank, between the channel and the main bank, and he made some. I think there is forty acres of land where the Government survey only calls for twenty-eight. And

Mr. Frizell claimed to make so much down here. I don't think he was really making as much as he claimed to, but he made considerable. As to myself, I have never done anything of the kind, but I have got some accretions. No, sir, no one else designed to help me get that. I don't think there was anything done excepting what nature did.

7442 As to the time when these cottonwoods I spoke of began to grow, I will say, in 1883 I was handling cattle on the river and frequently you would see a little bunch of bars that used to be rough with cottonwoods starting. Along in 1883 I think was the first time I noticed it. Yes, when the settlers first came to this country there were very few trees on the river. They were like hen's teeth, but after they commenced to settle here they began to plant trees, yes, sir, and the tree most readily accessible was the cottonwood, and it is a fast grower, yes, sir, and the result was that a large number of cottonwoods were planted by the early settlers. And after eight or ten years it is true that these cottonwoods planted by the settlers began to aid the old time cottonwoods in furnishing large quantities of cottonwood seed, yes, sir. No, sir, it is not true that about the time these first trees planted by the early settlers were coming into good bearing seed the cottonwoods began

7443 to get larger and to make a better showing than they had before. No, in 1883 there were no cottonwoods that had been planted by the settlers big enough to bear seed. It was these old trees that shed their seed by the southeast wind that had struck the river where I first saw them. Yes, sir, there were always some sandbars in this river, so that if there had been seed the cottonwoods could have grown on them, but they were not there to any extent, no, sir. As to its being true that these trees were getting big enough along about 1884, 1885 and 1886 to furnish seed, I will say, some of them were. As to its being true that up to the '70's and early '80's the country was not largely under fence and that first the buffaloes and then the cattle herds brought up from Texas helped to trample down and browse off any little growth that started, like cottonwoods, I will say, there was none to browse off. No, sir, they didn't keep them down so that they practically didn't get started, by the tramping up and down the river where the large herds of cattle went to water and back and forth in and out from the stream, because there was nothing for them to browse.

7444 No, sir, the prairie fires didn't have anything to do with keeping the trees off the banks in the early days; and as to my knowing how it was that the early settlers and the early historical works described the islands in the stream as practically the only places where the timber appeared on the river, with very few exceptions, I will say, down in the eastern part of the State that was a fact. There was tall grass growing in the bottoms. Here the grass was not very large. Yes, they had prairie fires even up as far as Dodge City, and they ran right up to the banks of the stream, but then they wouldn' burn those trees up the same as they did in the

eastern part of the State, for there was none there. Yes, sir, it might burn off and keep the little trees from starting, but there was nothing there to start them unless some man planted them.

As to its being a fact that the average flow of this river—excluding no particular periods—for the last ten years has been practically as good as it was either in the '80's or '70's for a like period of time, taking a ten year period, I would say, no, not the ten previous years of that. From 1875 to 1885 it was nearly all practically good years. That is, it commenced to drop off, and from then on we had it dry and bad. The bottoms were not productive and the flow of the river has been very scant.

7445 Yes, sir, the level of the underflow is as good now at the present time as it ever was. It is three feet higher now for the past year than it was for six or eight years previously.

As to whether I know as a matter of fact that investigations have shown that instead of the water proceeding out from the river beyond a few hundred feet from the banks the outlying ground water of the country is moving toward the river and with the river, I would say, I do not, no, sir.

Q. If it be a fact, as you conceded a while ago, that the level of the ground water on those ridges is higher than it is at the river, is it not one of the fundamental laws of nature that that water will run down hill and go toward the river instead of going from the river up there?

A. Nature makes the water run down hill; but while you say out on those ridges parallel with the river, you don't go to the head of that strata which carries the water.

7446 Q. No, but whenever you sink on one of those ridges and find the level of the water higher than the river at right angles, and the ground pitching toward the river, no difference where that water may come from, will it not go back to the river from that point?

A. Yes, sir, it would, if that strata runs to the river.

Q. So that coming down along this ridge for all these miles you see it has got to contend against that law of nature which is attracting it back to the river all the time, has it not?

A. Yes, sir. When they dug a well out on section 28, 22–16, south of here four miles, a man digging a well was told he would get water at thirty feet. They dug the well down. They got no water. He reached what they call the "poor man's line," and the fellow went after him and he says, "Why, you made a mistake in the stakes. I told you the other stake." They were nearly ten feet apart. And so he got good water at twenty feet, where the other well was dry all the way down. How do you account for that? What stopped that strata from running there? He got sheet water.

Q. I am talking about this underflow which you say helps the crops.

A. This is the underflow water which carries a stratum of water.

Q. Well, you don't say that this thing which you call an underflow, that is forty or fifty or a hundred feet under the ground, helps your crops, do you?

A. It don't do them any harm.

7447 No, it don't help them any, not that deep water, but there are strata of water a great deal higher than that. The one that gives the immediate returns is that water which you first strike when you start down from the surface, yes, sir. If in following the level of that water up over a ridge you find that it rises higher than the river, as to whether I should contend that that is supplied by the river up there above the river, I would say I do, sir, for the water in the river is holding this water up there while the water up three or four miles back—the river is forcing it down through that channel, and it goes over a ridge in the same way.

Q. And when you supply the Rattlesnake over the ridge from the river, you are practically siphoning it over?

A. That is right, sir, it works as a siphon.

The Rattlesnake runs from southwest to northeast, almost parallel with the river, and I should say it headed within three or four miles of the Arkansas river, and it runs from that to thirty miles from the river. Yes, sir, and lying between the Rattlesnake

7448 and the river is a ridge or elevation of sandy land, and the river is running along there somewhere nearly parallel with the Rattlesnake, yes, sir, and the general slope or fall of the country along the Rattlesnake is north and east and the springs come out on the north bank of the Rattlesnake—the north and west. In other words, they break out on the upper side of the general pitch of the country. Yes, sir, they are pitching down as they break out, that is right. In other words, if the country had a uniform fall from west to east they would come out in the same relative position as though a spring broke out to the west and ran east. Yes, sir, that is right. As to whether I ever knew of a stream, the Rattlesnake or any other, where the great majority of the springs did not break out on the up side of the country adjoining it rather than on the down side, I would say, I know back east countries where the springs are about equal on either side of the stream. Yes, sir, that

7449 is where there is a large drainage and the country pitches both ways. But wherever a stream runs across the country where the country has a general fall one way, then the springs break out on the upper side, yes, sir, and that is true in all of these streams. And whether there was any such stream existing as the Arkansas river or not, if there were any springs breaking out along the Rattlesnake and the various other streams I have spoken of, as to whether I would expect to find them breaking out on the same side on which I now find them, I would say, yes, sir. As to whether it is simply because of my theory that the Arkansas river is the good father of all this country that makes me think that the water comes from the Arkansas river, I will answer, that is the headwaters of it, yes, sir.

Yes, sir, the run-off of this country has as a rule very little effect on the flow of the stream, unless we have a very severe storm. Very little. That water goes into the ground, but I don't think it
7450 every reaches the ground water. I think the dry soil absorbs it all on top. As to whether out in Colorado where the soil is even drier and the rainfall even less if I think that reaches the underflow, I will say, I don't know about your Colorado conditions. Yes, sir, the headwaters of it comes from Colorado. As to whether I know of any place along this river in the vicinity of Larned where man has narrowed the river by narrowing the bridges and building abutments out into it, and embankments, I will say he has done it right here at our bridge. It has been narrowed forty feet.

The character of the bed of the Arkansas river through this part of the country is sand and gravel. A large part of it near the surface is purely shifting sands when the river is dry. A part of it is gravel and coarse sand too, yes, sir. When you have a bed of sand and loose gravel and you narrow the channel or draw together the banks of a running stream, as to what effect that may have on the bed of the stream—tending to spread it out—I will say (ob-
7451 jection), it raises the water. No, sir, with any amount of flowing water, with a current such as the Arkansas river has here, if you confine it and narrow it up it will not tend to scour out the bed of the stream and deepen it. As to why they build jetties at the mouth of a harbor, I will say, to keep the sand from washing in. Yes, sir, the tide scours it out, but you take it here where our men are hauling out these sandbars here, and they have that bar cleared out and the next flood that comes down fills that bar up again. It comes down from above. As to why they narrow the banks or the channel along a river that they are trying to make navigable anywhere, and as to whether they do it to scour the river bed—deepen it,—I will say, I don't know. I never saw that done as an engineer, no, sir. Yes, sir, I have read about, but that is hearsay. I know that they made those jetties at New Orleans and it scoured the channel there. As to whether it is a fact that the
7452 settling and plowing up of vast tracts of land along the Arkansas valley above here has furnished a great amount of loose material which in times of great storms washes out into the river and in times of very dry weather blows into the river that didn't either wash out or blow into it when the country was covered with the native sod, I will answer, in the early settlement here I used to see more debris coming down the river than I see now—more mud. Only a short time ago I saw the Arkansas river running clear water. That was this spring for two or three weeks the water was clear.

The uplands here are used for farming. They raise wheat, corn, oats, barley, etc., and they are more extensively farmed than they were twenty or twenty-five years ago, yes, sir. The great area of crop producing land in the valley of the Arkansas river in this country is on the uplands, and for the crops they raise they are

equally productive with the low lands. Wheat and corn on the bottom lands do far better than on the uplands. The
7453 valley lands and uplands under an equal state of improvement and at equal distances from town are about equal in price. It runs from about $30 to $50 an acre, according to improvements. As to whether I have ever made any investigation to see whether the taking of the water from the Arkansas river in Colorado at a time when the flow of the river is large in April and May and spreading it over the lands returns any considerable amount of water to the river later in the season when the river would naturally be low, I would say, no, sir, I know nothing about that.

7454 As to what speed I have determined from my experiments this underground water travels at, either in an hour or in a day or in a year, approximately, I would say I think it is about a mile to a mile and a half in twenty-four hours, according to the pressure there would be on it. It is in accordance with the pressure on it. The pressure comes from the height of the water in the river. That is it exactly. And this was on the bottom land, yes, sir, on the south side of the river and about a mile from it; and as to the character of the soil and the conditions there as compared with what we have here close to the river on this side, I would say it
7455 would compare a good deal as it would this side of Garfield two or three miles. No, it would not travel as fast through the ground on this side as it does there, because there is a streak of sand in there. It was in a very coarse streak of gravel and sand. Now, then, again, as I have been recollecting, I went back there again when the water was low. I could just find the source of that water, but I didn't spend time enough, and yet I was there a good deal longer than I was before and it didn't come there, and so at the head it would be the force of the water in the river that would force it through. It would travel a mile and a half over there at that head of water. Yes, sir, about that.

Yes, sir, I know where the salt well was sunk here in or near Larned. That was put down 742 feet, and it was cased and the salt water came out of the top of the casing, yes, sir. Yes, sir, I
7456 think they afterwards capped that so that it couldn't come up, and it burst up some along the sides of the pipe. It either leaked out or came up the sides and got into the underflow, yes, sir. As to whether it is a fact well known to all the people in this community who gave any attention to it that that salt water travelled along through the ground or down hill at the rate of about a mile a year and that wells about a mile away from the salt wells showed the effects of it in about one year and that wells two miles away showed the effects in two years and that wells three miles away showed the effects in about three years, I will answer, I should say no. When they put that water in the lake, until they drained that lake there was never any water affected their wells. Just the moment they drained that lake their wells were affected for the first mile—within

two weeks it was all salt. As to whether or not it is true that they had a fresh water well within just about fifty feet from this salt well from which they used water and that from the time the salt water came up and mingled with the surface or ground water nearest the top it travelled that fifty feet, as near as they could estimate it, in five days, I will answer, for a long time that well was just as pure after that went dry—after the lake was dry that well was just as good as it ever was. As to whether after that salt water got
7457 out of the well into the adjacent ground there it took it five days to go that fifty feet, or ten feet a day, will say, I don't know anything about that, but I know it was long time before that well got salty. As to what I mean by the lake, that was a place where they took a scraper and scraped the surface soil and built around a lake of five acres, with a twelve foot pipe, and filled it with that salt water. Now, just as long as that water was running into that lake there were no wells anywhere near, even that well right there that you speak of, a drive well, right close,—and even after the water got out of that lake for a long time after these wells down here got salted up the water in that well was pure. No, sir, after they capped this well and forced the water out through the soil it didn't take just about a year for the wells a mile away to show it down the stream. I can't say how long it did take. Of course I would hear them talk about it. I heard some of them say it took approximately a mile a year before the wells a mile away showed that, yes, sir, and some of them close by it were not affected for two or three years. Yes, sir, whenever you went back away from
7458 the river up the grade it took it a much longer time to spread laterally than it did to follow down the general level of the country, certainly. Now, as to whether there were wells within perhaps a quarter or half a mile extending laterally out from the general trend of the Arkansas river that didn't show the effects of the salt water until wells down the river a mile would show it, and some of them a little farther off never did show it, I will say, that is something I don't know. I know some of these wells that first struck the salt water are just as good to day as they ever were. As to whether they drained that lake and uncapped that well and ran the water directly into the Pawnee to let it drain off down the river so that it didn't affect those wells, I will answer, yes, sir, it rushed off. It runs down directly into the creek and goes into the river, yes, sir. If the outlying water in the valley is supplied from the river, as to whether I know why it is that none of the salt effects from this well now appear in those wells since the water is going down into the Pawnee and Arkansas river, I will say probably the other water is taking the place of it.
7459 No, sir, no wells that I ever knew of up the river any distance ever showed any effect from this salt water. As to whether any wells laterally from the river to any considerable elevation, even twenty or thirty feet above the level of the river, ever showed any effects of it, I would say, yes, sir. Right here in the

northeast part of the town, the northeast part of the town here is twenty feet above and the well that showed that was about forty feet deep. Yes, that was at a point twenty feet below the point at which the salt well was discharging; that is, the well was forty feet deep, because it came out of the surface of the well at that time. And three years after the lake was drained this well I speak of that went to salt was so much so that it killed all of a man's vegetables in his garden, about two acres. Yes, sir, the top of that well was about twenty feet above the level of the river, and the well was about
7460 forty feet deep, yes, sir. Yes, sir, and the water in the well would be about twenty feet lower than the depth of the river, which would give it a grade of twenty feet in going that distance. As to whether I ever knew a well out laterally from the river where the water in the well was lower than the level of the ground where the artesian well was that showed any effect from that salt water, I would say no, because I never ran any levels. As to whether it is a fact that down the river—that is, with the course of the river—wells two miles from the salt well would not show any effect from it until two years after the well was capped, I will say, that I don't know.

Redirect examination.

By Mr. ASHBAUGH:

Yes, sir, I know the land that Mr. Frizell used to have up here and I know about his wells there. (Objection.) I know that he had wells there and stoned them up. I guess they were six
7461 or eight feet in diameter. And then he sunk a perforated bottom of sheet iron steel three or four feet high and put a well on top of that to keep the sand and gravel out; and then he put on a very big tower and windmill on top and large eight or ten-inch pumps, some of his own patent, and in these wells he used them to irrigate and expected to irrigate about a hundred acres or more. He did irrigate about sixty acres at times. Now, then, they had in those wells a gauge to see how much the pumps would lower the water in them when they would start them. They took them out and saw how the water stood, and one spring I was up there spraying some fruit trees and I went in the morning and sent the teams in the afternoon previous, and I asked the foreman there how much the water raised in those wells. (Objection.) So I looked at those gauges and I saw a rise of over two and a half feet, from the flood on the night before, to what it was twenty-four hours previous. Yes, sir, those wells rose two and a half feet according to the condition of the river.

7462 Yes, sir, I know of the underflow pools up the Santa Fe railroad. They came pretty nearly going dry once. Some years there is a little spot not twice as big as this table that was open water. As to the condition of the river when they went dry, I will say it was dry. When the water in the river is up those pools

are full of water today, nearly half an acre. They are seventy or eighty rods back from the river. Yes, sir, they do respond to the condition of the river. They can be seen right from the railroad. The railroad runs over the end of them. Yes, sir, there are rushes growing in them now, right around the main holes.

As to what I say about the velocity of the current of the underflow being different according to different soils, I would answer, more force. As to whether the difference in the soil has any effect upon the velocity of the current of the underflow, I will say, why, the pressure where it would be coarse sand and gravel—it would run much faster than where the fine sand was.

Yes, sir, I know about a ditch up the river here. I laid one
7463 out there for the Pawnee Ditch Company. (Objection.) It had water in it in 1886, and I think the water came down in the spring along early. They had water in 1887. That was the last water in that ditch. As to why it was the last water in that ditch (objection), I will say there was no water came in the ditch. As to whether the dry times that I have spoken of in the river have increased in the later years, I would say, yes, up to 1902. There was less water each year. (Objection.) As to those divides between the Arkansas river and the streams and as to whether those
7464 divides are simply composed of sand and porous soil, I will say, it is what we call a loam soil—porous. Yes, sir, so that the water could pass beneath them. (Objection.) As to whether there is anything beneath this line of ridges out here that would prevent the water from passing through it, I will say (objection), no, sir, not to my knowledge. As to the level of those streams being lower than the Arkansas river, and as to whether I had any instruments to test that, I will say, yes, sir, and I speak from tests made by my instruments. As to the Arkansas river up at Pueblo being the source of this ground water, I will answer, I said that was as far as I had been up the Arkansas river, and when I spoke of
7465 the Arkansas river below that, yes, sir, I took in all of the tributaries, the Purgatoire being one of them, which I saw fifty times.

As to any accretions along the banks being made by artificial means, I will answer, well, that I couldn't say, only what here I do know. Probably here under my observation in my section eighteen or twenty acres on the west side of the river, and it is much more on the southwest corner of mine. There would be forty acres there, and I think as much more where Mr. Frizell made a hundred acres. As to whether the river has narrowed its banks all up and down here for a number of miles, I will say, yes, sir, and that was by artificial and natural means, both. As to what extent by natural means, about eighty-five by natural means and about fifteen
7466 per cent. by artificial means. As to the first time I noticed the cottonwoods beginning to grow on the sandbars in the channel of the river, I will say, I never noticed that before 1883, and from that on you could begin to see the timber springing up or coming up.

As to my speaking about the springs being on the west side of the Rattlesnake and as to whether there would be any springs
7467 there if there were no Arkansas river, I would say, if there were no feeders from above there wouldn't be any springs there.

No, sir, the bridge here is not as long as it used to be.

Recross-examination.

By Mr. DAWSON:

Q. You started to say that Mr. Frizell's foreman or somebody was going to tell you something and then when it was objected to you stated that you noticed that the gauge had changed two feet within the twenty-four hours. Were you there during the twenty-four hours previous?

A. No, sir.

Q. How do you know whether the pumps had been running in that time and that this had lowered the water and then that it had raised again after the lowering?

A. I have seen the water——

Q. No, sir, I didn't ask you for any enlargements. I asked you the question as to how you knew whether those pumps had or had not been running previous to your observation of that gauge?

A. Simply by hearsay, sir.

I think I know that Mr. Frizell gave a great deal of attention to those wells because he was attempting to irrigate and also because he was trying some new pump in which he was interested, and I drew the plans for those pumps myself. As to knowing as a
7468 matter of fact that Mr. Frizell, who owned the land and pumps and ran them and was observing, testified that the rise and fall of the river had absolutely no effect upon the level of the water in the wells so long as the pumps did not run, no, sir, I don't know it, and I know it is false if he said so. Allow me to state that right here. I have seen those wells running, and when those wells were shut down, in one hour's time it would rise to its level. Yes, sir, after he had pumped the water out.

Q. That is true; Mr. Frizell stated that.

A. That is right. Now, those wells, according to the statement of the man, had been running for twenty-four hours, and it showed—the ground—that there had been no water taken out in twenty-four hours previous to that time, at the time I was there.

Yes, sir, I attempted to say it would rise two feet because the river had raised. As to how I could tell the difference between the river rising and it rising from a point to which the pumps had lowered it, because the pumps, if they were not running, in one hour's time it would rise up to the level of the water in the river. If
7469 they were shut down. I have seen that done several times.

It was not only once I was up there, but more. I was there three or four or five times, spraying his trees, and saw those things.

As to whether the river in the few days I was there spraying his trees would be going up and down for my benefit to see the rises in those wells, I would say, no, sir. What I mean to say is simply that when the pumps pumped the water out of the well it would rise up again when they stopped. That is what I mean and what I said. As to whether I mean to say that at the time I testified to the river had raised two feet and that this rise in the well was from a rise in the river, or whether the river stayed the same, I will say, it had raised two feet.

Q. Did you go to the river?

A. I will tell you why. I was over here spraying for Mr. Banks, and sent my man and team up there, and I went home and I saw the river was rising. Next morning I took my buggy and started to drive to Frizell's and saw the river was bank full. And I went up there and asked Potter how the wells rose. He said he didn't know, he hadn't pumped any for some time. Now, this is just as I got it from him. And I went up there after dinner and we went out and measured it. He said the water was so deep. He
7470 had the marks. Now, he said the mark was so much. I looked at it, and the water had raised thirty-one inches. That is just exactly the difference from what he said the water had raised, after they quit pumping, up to the natural level, forty-eight hours, nearly, before.

Q. Though you hadn't been there for the twenty-four hours before?

A. No, sir.

Q. Why did you say he didn't pump for twenty-four hours when you now say the rise is for forty-eight hours?

A. Well, he said they had not pumped for two or three days.

Q. Then it was more than twenty-four hours?

A. Yes, sir.

Q. And you had not been there for two or three days?

A. No, sir.

Q. And all you had to go by was that he said the water was a certain height in the well?

A. Well, they kept tab on the water.

Q. You didn't know their system?

A. Well, I could see it up there where they wrote it down, that is all.

Q. Did you write down that on May so and so—a certain date?

A. No, no dates at all. It was simply the measurement in feet and inches.

7471 Q. Then you don't know how deep the water stood in that well twenty-four, thirty-six or forty-eight hours before?

A. No, sir, I do not.

Q. So far as your own observation was concerned you knew simply where it stood at that moment?

A. Yes, sir.

Q. And yet you are attempting to testify here that that water had

raised thirty-one inches after the river came up and that the river had come up within forty-eight hours?

A. I have seen that water since that more than forty inches lower than that mark.

Q. Well, I say it is on that you are basing your statement that it had raised thirty-one inches, is it?

A. Yes, sir.

On a straight line south, parallel with the river, where it would come out naturally, the well was about two miles from the river, a little bit over, and to the east about a mile from the river. As to whether the inference I drew was that the rise in the river had made this change of thirty-one inches in the well within at least the forty-eight hours previous, I would answer, I don't know how long it had been.

Q. Well, you said the rise in the river occurred only forty-eight hours before?

A. Yes, sir, the rise in the river did it, of course.

Cross-examination.

By Mr. CAMPBELL:

7472 Yes, sir, in answer to a question propounded by counsel for the State of Kansas I said that the water in the river had an influence upon the underflow for a distance of twenty miles.

Q. How long after the water rises in the river does it take it to affect this underflow twenty miles distant?

A. Well, as I stated, forty-eight hours from the time the water struck or passed Dodge or passed Kinsley I started from here and went to the Rattlesnake, and the water there was commencing to rise up.

Q. That is twenty miles distant?

A. About that, yes, sir. Now, one thing right here—I don't want you people to think that I want to make you understand that the water was there from the river at that time, but the head of the water in the river was pushing the water that was below up to the surface down there in that vicinity.

7473 Q. Now, it is not necessary for a witness to argue in answer to a question. You are an intelligent witness and I ask you how long a time it takes to affect the underflow twenty miles distant. Now, you understand that question and can answer it without an argument.

A. It takes about three days.

Q. So then it takes this water three days to travel twenty miles?

A. I don't say that.

Q. How do you explain your answer, then?

A. I explain it this way—by the water in the "stand-pipe" forcing that that is in the "pipes" below ahead of it, up. The "stand-pipe" don't have to travel a mile.

Q. You don't mean to say, then, that this water travels?

A. No, sir, I do not.

Q. But it affects the underground flow?

A. Yes, sir.

Q. And it takes it about three days to affect it a distance of twenty miles?

A. That is what it did in that case I speak of.

Yes, sir, I believe I stated in answer to a question propounded by counsel for Colorado that in 1904 we had water here in the river all the while. No, it was not a pretty good flow of water the whole year round; it was generally a pretty small stream.

Q. Now, if during a portion of the season of 1904 the river was dry at Garden City the water that you got here could not have come from Colorado, could it?

7474 A. I don't know where it came from.

I live about 800 feet from the river. I have 2,000 bearing apple trees, over twenty-five acres. Yes, sir, I raise a good crop of apples there, generally speaking. I have never had a failure, strictly speaking. That orchard was planted in 1891, and part of it in 1886, and is a pretty good bearing orchard yet, yes sir.

The aniline I spoke of I got here at the druggist's. I couldn't tell which one. I paid money for it, but I couldn't tell how much.

7475 I couldn't tell how much I purchased, even. I purchased it along in the summer. There might have been a dozen there when I purchased it. I don't know. I couldn't tell you. At the time I made the experiment there was no one with me until one day I took up somebody, I forget who it was. I was going over to look at it. I guess I used all that I purchased.

Q. Who did you ever tell this story to before you told it on the stand today, about experimenting with aniline?

A. I don't know whether I told Mr. Nisbet about it or not.

Q. Did you ever tell it to anybody?

A. Did I?

Q. Yes.

A. Well, I don't spread those news very often.

Q. Then you came here to town and got that aniline, went

7476 out there and dug two trenches and made that experiment and never said a word to anybody about it until you came on the stand here today?

A. Well, sir, I will tell you—yes, I guess that is a fact, because I don't spread my business unless it is somebody else's business to know it.

Q. And you did it not for any particular purpose but to satisfy your own curiosity?

A. To satisfy my own curiosity, yes, sir.

7477 CLYDE B. JOHNSON, Larned, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live near Garfield, Kansas, and have lived there two years. Prior to that time I lived between Ellinwood and Great Bend, Kansas. Dartmouth Siding is where I was raised. As to how long I have lived along the Arkansas river, well, sir, I came here in 1876, twenty-nine years ago. I haven't lived along the Arkansas river continuously during the last twenty-nine years, no, sir. In 1879 my folks moved to Oregon and stayed one year and moved back, and twelve years ago I moved to Washington and came back here four years ago this summer and went back on the home place east of Great Bend. During the summer of 1903 and up to the spring of 1904 I lived here at Garfield. I live two and a half miles from the river. No, sir, I can't see the river from my
7478 place. I know the condition of the river from August, 1903, down to May, 1904. As to its condition, there was no flow, because there was no water in the river.

As to how the average flow of the Arkansas river for the last ten or twelve years as I have seen it compared with the average flow for the first ten or twelve years that I knew it, excluding floods (objection), I would say the river used to run a good stream when we came to this State, and the first time I ever saw the river dry was in 1879. There were loads of fish in the Arkansas river. I don't know whether there was an irrigating ditch in Colorado then or not. It was immaterial to me whether there was or not. As to the last part of the question, I will say, we haven't had the flow we used to have. As to how far back the flow of the river affects the level of the underflow, (objection), I will answer, well, sir,
7479 I only farm south of where I live where it is only two feet to the quicksand. The Arkansas river raised there one year, about twelve years ago, the season I left there—I think it is twelve years if I remember right—the river got out of its banks and it raised in the afternoon about three feet. It was school meeting day. I don't know what time of the year they used to have it, but it was in July or August, I have forgotten which,—but anyhow that evening I had a garden I expect about 1,000 feet back from the river and the water raised in the garden two and a half feet deep. As to what caused the water to rise in the garden, I will say, it came up through the ground. No, sir, there had never been any rain. As to how far back, so far as my information goes, the flow of the river influences the level of the underflow (objection), I will say, from what experience I have had it is between the divides on each side of the river. Yes, sir, it does go back that far.

Cross-examination.

By Mr. DAWSON:

7480 I don't know exactly how far this garden was from the river. I expect our garden spot was all of two or three hundred yards, anyhow, from it. Yes, sir, it was on lower ground than some ground between it and the river. Yes, sir, there is a swale or low place around through there, but as to whether that looks as though at some time in the past or in the early history of the river it might have run around through there, I don't know as it ever had, but the river don't get up over its bank there. It seeped up there. Yes, sir, this river has always been one of shifting channels. It moves back and forth across the valley. There are different channels, yes, sir, As to whether it is true that in the bottom land one can find places that look as though at some time in the past twenty-five, fifty or a hundred years the river might have come
7481 around through there, I will say, I don't know. I have heard men argue that there are old river beds in through different localities, but whether that is a fact or not I don't know. I don't know that it has that appearance. We are liable to have gravel beds most anywhere. I expect this ground where the garden was was two or three feet lower than the bank of the river, and about two or three hundred yards away, yes, sir.

I was six years old when I came here in 1876, and the first ten years I was here I was between the ages of six and sixteen, yes, sir. As to whether it ever struck me that the river looks bigger to a boy of eight years than it does to a man of thirty-five, I will say, the river used to look bigger then, because there was no trees grown up. The river used to have deeper banks than it does now. My folks used to do a good deal of fishing. Times used to be different in this country, and we used to make a living any way we could, and we used to live a good deal on catfish in those days. Yes, sir, the people are a good deal more prosperous now than formerly.

7482 As to how long since 1876 I lived somewhere else, I will say, my folks lived one year in Oregon and I went out there and was gone about five years—yes, six years. I came back here four years ago. That would be nine years ago I went West. I was thinking it was longer than that. It has been four years in July since we moved back here. We went out there in February, I believe. It would be six years in February, if we had stayed until February. Yes, sir, we went away about 1895 or 1896 and came back about 1901. As to whether I think it is a little extraordinary that under oath in an important case of this kind I should say that the average flow of the river, excluding flood periods, for the first ten years that I knew it, was greater than the average flow for the last ten years, when five years of the last ten I was in the State of Washington where I could not see the river and for four years of the first ten I was a boy between six and ten years old, and as to

whether that is not a pretty broad statement for me to make, I would say, well, I don't know as it is. I used to fish on the
7483 river altogether when I was a little fellow. As to how I am going to state the average flow of the river on my oath for ten years when five years of that time I never saw it, I will say, well, I know, but that five years I am not speaking for. As to whether counsel asked me this question: How does the average flow of the river for the past ten years, excluding flood periods, compare with the average flow of the river for the first ten years that you knew it" (objection), I will say I can't speak only of what I have seen for myself. When I am not here I don't know what shape the river is in, only what I can see by the papers. You see I am always taking papers from here right along and read-
7484 ing them. As to whether I don't think it was stating it pretty broadly when I said that the average for the first ten years was greater than that of the last ten years when I knew nothing about five of the years, I say the ten years of what I have seen. When I was not here I didn't see it. So that would get it back fifteen years, if you want to take it that way. Yes, sir, I want to cut out that five years.

As to whether the channel of the river has filled up or not, I will say, well, sir, when we came to the State there were no trees on the river and there was no big sandbars—these islands that we have now-a-days. There was no made land that we have nowadays. Nature goes to show for itself by the river not flowing, and there has been trees that have sprung up, so that there are many trees on the Arkansas river now-a-days. Yes, sir, that is what I refer to.

7485 J. J. NESBIT, Larned, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live at Larned, Kansas, and have lived here since 1887, and have been acquainted with the Arkansas river since that time. I have charge of the water plant here at Larned. I am superintendent of the water works, and have been superintendent of the water works since 1887. I built the plant here in that year. The water works is located about half a mile straight south of the court house here and about thirty feet from the bank of the river. Yes, sir, I have had occasion to notice the flow of the river during the years since 1887. As to how the flow of the river prior to last
7486 year, for the last ten years, excluding flood periods, compares with the flow of the river during the first ten years, excluding flood periods (objection), I will say, my observation is that the flow of the river has diminished. Yes, sir, there have changes taken place along the river for a number of miles up and down in the river bed. There have been islands formed and trees have

sprung up and grown. I would say these trees date back eight or ten years. Yes, sir, the islands are greater in number and greater in size than they used to be. I don't think the river banks are as wide as they used to be.

As to how far the flow of the water in the river affects the level of the underflow (objection), I will say, I think it affects it to
7487 the divide on each side of the river. As to what reasons or facts have led me to think that, I will say, I have noticed the water in our well going up and down, and water in wells out around. As to whether the water in the water works well and in other wells here responds to the condition of the river regardless of the question of whether or not there has been rain, I will answer, it does in our well.

Cross-examination.

By Mr. DAWSON:

As to whether I have any accurate information on any well except the one which it has been my business to keep track of, I will say no, I have not; and that well is situated about thirty feet from the bank of the river, yes, sir.

7488 WILLIAM A. HELLER, Larned, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived in Pawnee county thirty years, and about half a mile from the river. Yes, sir, I have had occasion to notice the flow of the river during those years. I have lived right there by it pretty nearly all the time. Prior to last year, as to what was the average flow of the river, excluding floods, in comparison with the flow of the river at the same period of the year in the first years I knew it, I will answer, in the last years there was none and it was completely dry, only in flood periods, and the first years I was up there we had water in the river all the time, all the way from knee deep to waist deep, all the way across. As to how far back from the river the amount of water in the river influences the level of the un-
7489 derflow (objection), I couldn't say just how far back. As far as my farm went the ground was moist all the time. We could plow any time in the year, when we couldn't plow in other places. My farm extends back about half a mile. Yes, sir, I had wells there. As to what would be the condition of the water in the wells in comparison with the amount of water in the river, I will say, well, whenever there was a flood the well would rise, but when it was normal it would go down about the normal of the river. Those wells are about half a mile from the river. Yes, sir, I have noticed a difference in the condition of the channel in these later years. As to that difference in the first ten years, there were two channels up

where I live and there was a big island in the river, and I guess there was 150 acres in that island. There was a channel on the south side of that island and one on the north side. It appeared the
7490 island split the main channel and throwed it on both sides of the island. I have noticed that the channel on the north has almost filled up to the island. It is almost all made land to the island, within a few rods, and that was somewhere in the neighborhood of thirty-five or forty rods from the main bank to the island. As to how long it has been since that filling took place, I will say, that took place since the river has been going dry. I couldn't recollect just how long. It has been that way the last ten years, I think, that that filling has taken place. Yes, there have been changes on those islands as to trees growing up. There are lots of trees growing all along where the land is made, and several sort of low islands have formed since—small islands. As to why those trees didn't grow before that time, I would say, there was too much water. They didn't have a chance to grow, because there was no land for them to grow on. The water was running all the time.

Cross-examination.

By Mr. DAWSON:

7491 Yes, sir, there were trees on this island of 150 acres two years ago; not many, only a few. As to their having grown bigger, well, no, they have been cut down several times and burned and killed. I suppose they are not very big now. I have not been on that island for three or four years. That island next to the railroad land, it will eventually—about four or five rods more and it will be annexed to the railroad section No, sir, nobody has thrown anything in there to fill that channel up. Yes, sir, the channel on the other side has cut out some. Yes, sir, it got away with some land that belonged to somebody else—with a little on the island and a little on the main bank.

I came here in 1875 and have been here ever since, except the last three or four or five years I was away—no, I was away only a year. My business is farming. No, sir, I don't run a farm now. I am working here in town at a grocery store. I have been
7492 there about three years. No, sir, I have no farm land now. It is all gone. Yes, sir, the first ten years we always had lots of water, from knee deep up. Of course when you get out in the channel it would be deeper. Yes, sir, that was a regular thing all the time up to 1879, I think. Well, not all the time, but then there was water running all the time from 1879—there was as much water —it went dry that year, and the next year it ran again. Yes, 1880 was a dry year. Yes, both 1882 and 1883 were very dry, but still we had some water, and in 1884 and 1885 we got lots of water, and we got lots of water in 1886. Then 1887 and 1888 were dry again, yes,
7493 sir. As to whether it is a fact that about every three or four years ever since I have known this river we have struck a year

when there was very little if any water in it, I will say, the first ten years there was very little water, but the last ten years there was none. No, I don't mean to say the river has been dry for ten years, but I mean to say that it has been dry in some years altogether and in some years there was a little water running but in the last ten years there was no running water but what we could go across it anywhere and wouldn't get in knee deep. As to there being a good deal of running water last year, that was flood time, of course. Yes, sir, it ran nearly all the year; but I was not on the river last year at all. Yes, sir, it has been running a good deal this year. As to whether I call it a flood just because there is water in it, I
7494 will say, no, sir, what I call a flood is when the river goes dry and strikes a flood and it runs a couple of months and maybe six months and then it goes dry again. What I call a running river, it runs all the time. Yes, sir, it ran all the time in 1879 at my place. No, sir, I didn't hear some of the witnesses just testify that it was dry in 1879. They didn't say it was dry in 1879. It ran water then, and it ran water for the first ten years up at my place every year. Yes, sir, all the year there was a stream of water running. As to whether I said just a moment ago that in 1879 it was dry for a while, I will answer, it was what I would call a dry year—a little stream running. It was not altogether dry like it has been dry so that you could walk over it anywhere without getting into water. No, sir, it has not been about as good an average the last ten or twelve months as I ever saw it for ten or twelve months. Yes, sir, it has been running a good stream all of that time, but I have seen it run a bigger stream than it is running now. Oh, no, not for ten months right straight along. No, sir, the average
7495 for the last ten months has not been about as good as I have seen it for a whole ten months. As to when it was better, I will say, why, here in the winter it didn't run as good as it has when I have seen it. Well, averaged up it might have done it, taking it on an average.

As to how I came to get into this water case and as to who I first talked with about it, I will say several people talked with me about it and asked me what I knew about it and everything like that. I lived right there on the river. In the first ten years when we had water in the river all the time we raised good crops right there on my place, and after the river began to go dry we began to fail in crops right along. Yes, sir, they were pretty dry years, and without rain too, but the ground was moist all the time. Yes, sir, you could plow it at any time in the year.

As to whether the ground freezes here in the winter when it is moist, I will say of course it does that anywhere in a cold country. It freezes here. Of course a man must take into consideration—he don't mean when the ground is froze so hard you can't do anything with it, but you must take into consideration when a man
7496 says he can plow any time it is when it is time to do this work. Of course when a man says he can plow any time he

don't mean he can plow when there is ten feet of snow on the ground or anything like that. When I first came here we didn't think we could raise a crop unless we sowed it in February, but we got over that.

Land is higher and everything else. As to whether one can raise a great deal better crops of late years than you could twenty years ago, on an average, I would say no, I don't believe we raise any better crops on an average, only we raise them oftener; that is, they have crops more years. Yes, sir, fewer failures.

As to whether our rains come better distributed, one year with another, now than they used to, no, I don't think they do. I think the extreme is the other way. As to how we come to raise crops more years now than we used to, well, it just happens the rains come a little later, that is all. Yes, sir, they are better dis-
7497 tributed and it comes a little later, and saves the crop. It don't take much rain in this country to raise a crop if it comes at the right time. No, sir, if you get a dry year and don't have rains at the right time you don't have good crops, and if you get a year with nice rains equally distributed you do get a good crop, yes, sir.

Redirect examination.

By Mr. ASHBAUGH:

During those early years when there was very little rain, not enough to mature a crop, as to whether the condition of the underflow would assist in growing a crop, I will say, yes, sir, right close to the river it would. Yes, sir, on the bottom lands.

Recross-examination.

By Mr. DAWSON:

That was about half a mile from the river. Well, of course I farmed the land half a mile from the river, but the corner of my quarter section is only about forty rods from the river bank, and then it is half a mile from the river up to my north line, and I farm the north 80 of my quarter, which would make it half a mile from the river.

7498 J. P. WORRELL, Larned, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I am seventy-one years old last April. I have been in Pawnee county thirty-three years the 12th day of this month. I have lived in Larned most of the time. I haven't lived farther than a mile and a half from town. For twenty years I have lived right up this street. I built a house and have some property up there. As to

my business, practicing law is all I ever did in Pawnee county. I am well acquainted with Pawnee county around here. In an early day I handled some stock here—cattle and sheep—and have been all over the country and am pretty well acquainted with it.

7499 As to whether I have been as far south or east as the Rattlesnake, I will answer, oh, yes, many times. In 1874 I was one of a party of four or five that ran a road from here to the Rattlesnake, or from here to Medicine Lodge, rather, across the Rattlesnake, and plowed a furrow so as to give those gentlemen an opportunity to follow it up, but I have been on the Rattlesnake many times. As to whether the bed of the Rattlesnake is lower than the bed of the Arkansas river at a corresponding point, I will say that the only way I can answer that question is that that is my information. Personally, I never tested it at all. (Objection.) As to what influence the flow of the Arkansas river has upon the water of the Rattlesnake (objection), I will say I only know the fact that when there is a good body of water in the Arkansas river there is more water at the Rattlesnake than when the water is low in the Arkansas river. As to whether that is true, yes, sir, that is true, absolutely. I know that of my own knowledge. Yes, sir, that same fact

7500 is true in regard to Coon creek. That is absolutely true. At the Coon Creek bridge between here and Garfield, while I never measured it, my observation would be that when the river is up and the water is flowing freely it will sometimes rise as much as two or three feet there without any kind of rainfall on the outside. As to how far that bridge is from the mouth of Coon creek, I can hardly tell that. It seems to me it can't be over a mile and a half from that bridge to the river, but whether the mouth of the creek—I can't tell just exactly how far the bridge is, but it is about a mile from the Arkansas river, I think. As to how far up Coon creek that condition extends, I couldn't answer that question, for the reason that I never paid attention enough to it to know. I know that ford I am speaking of when we forded it where the bridge is now. We used to ford it about twenty rods above where the bridge stands, and I would only observe it there in crossing the creek. As

7501 to whether I have observed it sufficiently to state as a matter of fact that the flow of Coon creek is greater when the Arkansas river is high although there have been no rains (objection), I will say, well, sir, all the observers I have seen or heard talk about it say that the underflow of the Arkansas river goes into Coon creek. Scientifically, I have never tested it. (Objection.) As to the fact, from my own observation, that the waters of Coon creek are higher when the Arkansas river is flowing full than when the Arkansas river is low, although there is no rainfall, I will say, most undoubtedly. There isn't any kind of doubt about it. My own observation has taught me that. I have crossed it half a dozen times or a dozen times a year with that observation. I have crossed Coon creek when it would be up eighteen inches, maybe, higher than its

usual run. We would drive into the creek and the very first remark would be "Why, the river must be up." Without any knowledge of the river being up we would make that observation, then we discovered that the river was absolutely up. From all these
7502 observations and facts I have noticed, as to what I conclude as to the influence the Arkansas river has upon the flow of Coon creek when there is no water to affect either (objection), I will say there is no doubt in my mind but what it is the cause of the rise of the water in Coon creek—that Coon creek rises in proportion to the height of the water in the Arkansas river by reason of the underflow. Where I have been crossing Coon creek, where I am personally acquainted with it, it is about a mile or maybe a mile and a half from the Arkansas river. I am not exactly sure about that, but Coon creek empties into the Arkansas river down below there. Down below Garfield, yes, sir. From all the observations I have made in this county, as to whether the flow of the water in the river affects the underflow (objection), I will state that it ab-
7503 solutely affects all of the land lying between the two bluffs, and I have an open well on a farm about a mile and a half—it is on the northwest quarter of section 30, 21–16, just about a mile and a half from town—that I have watched a good many times, and I have observed that the water is higher in that well when the river is up than when it is at a common stage. That well would probably be a mile and a half from the river, yes, sir. I have my doubts about that being the water that strikes my well. I think it
7504 comes from farther up the river. Yes, sir, I think it comes from up farther, because if our theory is correct the water flows down stream, with the stream, to a great extent. I don't mean it points right down with it, but it don't follow it. It don't strike anything above the point where it starts from the river.

As to the average flow for the last ten or twelve years prior to last year, beginning with about 1892 and ending with about 1903,
7505 exclusive of flood periods, compared with the average flow for the same time of the year during the first years I knew it (objection), I will say, well, sir, from my own observation my judgment is that from 1873 up to about 1883 the Arkansas river was entirely dry to my recollection. As to the last ten years prior to 1904, it has been dry more times than it has had water in it. Yes, sir, during a large portion of each year during the last ten years it has been dry a larger portion of each year. That is my observation. I have kept no particular account of that, but am only giving it from memory now. As to the flow of the river during the fall of 1903, and the winter of 1904, I will say, well, now, sir, I can't answer that question because when it comes right down to a specific time I have kept no account of it. As to what effect this loss of water has had upon the level of the underflow in the valley (objection), I will say when the river is up the underflow of course runs down with
7506 the river. I should judge that from the first ten years I knew the Arkansas river up to the last two years we have had big

water in the river, but up to that time I should say the underflow was from one to three feet below the surface of what it was the first ten or twelve years I was here.

Oh, yes, I have noticed changes in the appearance of the river channel in the last ten or twelve years. In the first place, the channel of the river hasn't got the scope for the water to run in that it had ten or twelve or thirteen years ago, for the reason that islands have formed, lands have been attached on the sides that has made the channel narrower, and now the river in my judgment—oh, it seems to me the channel isn't anywhere over two-thirds as wide as it was twenty-five or thirty years ago. No, sir, on the average it is not as deep. Oh, yes, all of the islands and the land on the sides have grown up with trees. As to the cause of that, the only cause I can give, and I think it is a natural one, is that the land is above the water and the seeds caught onto land and grew when it couldn't do that when the water was running all the time. Whenever that land got above the channel of the river and the water quit running over that land, of course there was nothing to prevent cotton-
7507 wood trees from starting there. As to what effect it would have upon the bottom lands through this county and adjoining counties if the flood waters of the Arkansas river could be impounded in Colorado, or in Kansas if reservoir sites could be found, and used for irrigation purposes during the dry season of the year and the normal flow outside of flood seasons be allowed
7508 to run, (objection), I would say that my judgment is that in old times twenty-five or thirty years ago, with that flow of water crops could be raised on most of the bottom lands. If that water should be shut off and we could get no water except in flood times, it would be more of an injury to the crops along the banks than it would a benefit. That is my judgment. But, an-
7509 swering your question, I will say my judgment is that it would be very beneficial; If we would get the natural flow of the Arkansas river during the dry season of the year it would certainly be beneficial to the bottom lands, because it would be a sub-irrigation to the bottom lands here and we could raise crops under it.

Cross-examination.

By Mr. DAWSON:

7510 As to whether the Rattlesnake is a stream that runs water all the time or goes dry, I will say, I never say it dry, but I do think it goes dry sometimes. Coon creek is never dry its full length. There are other seasons of the year when it doesn't run all along, but there are large holes for a quarter of a mile. I don't think I ever did see the Rattlesnake running water when the Arkansas river was dry. I don't think I was ever on it to know. Yes, sir, I have seen Coon creek running water when the Arkansas river was dry. It is affected by rains. I don't know whether the Rattlesnake is or not. I don't think I ever did see Coon creek running a

small natural stream when the Arkansas river was a bed of sand up the river above here. Oh, yes, I have seen the Arkansas river when it was dry and a bed of sand. Yes, sir, I have seen Coon creek when there was no water in it, but I don't know when;
7511 a number of times. As to whether I said it never went dry for all of its length, I said there were holes in it that didn't drain off, and yet there is water in Coon creek all the time. There will be holes maybe half a mile long where there would be lots of fish and the water will be two or three feet deep, but it doesn't run. I have seen Coon creek when it didn't run. No, sir, I never did see it as dry as I have seen the Arkansas river.

Yes, sir, the grasshopper year was 1874. No, the river was not dry from below here, except in holes, almost all the way to the Colorado State line that year. That is not my recollection of it. There were certain sandbars in the river and a good portion of the bed of the river was dry, but there was certainly a running stream all the time. It is possible that there were miles and miles of the river above there where there was no running stream. I am not giving any history of the Arkansas river above this county. As to there being miles of it in this county where there was no running stream, I will say I don't think so. Concerning the year 1879, as to whether there were miles of the river in this county at that time where there was no running stream, I will say, I have that recollection. In 1883 that is the fact. I know that because I drove a herd of sheep right up the river. Well, from here to Garfield at any rate there
7512 were miles of it in which there was no running stream. That is as far as I went. Yes, in 1874 it was at least very, very low, and as to 1879, I don't remember 1879. As to whether I heard the witness just one or two before me testify that it was dry in 1879, well, he might remember, but not me. I am only giving my own testimony. As to the fact that he might perhaps refresh my recollection, I will say I thought it would, but it didn't. No, sir, I don't remember as to 1879. As to remembering 1903, two years ago, how long it was dry, I will say, well, I don't know. As to why I don't remember for two years ago and have a better recollection as to 1874, I will say, oh, yes, I have occasion to know about that.

For the last ten years I have lived about half a dozen blocks up this street and perhaps half or three quarters of a mile from
7513 the river. No, I haven't been practicing law in the last eight or ten years. No, I have had no active business at all As to whether I have had occasion to make frequent trips to the river during the last ten years, I will say, I scarcely ever make a trip to the river unless it is pretty high. I always go down then. No, sir, unless it is pretty high I paid no attention to it. And that is true for the last six or eight years anyway, yes, sir. Yes, for the last ten months I could have had that excuse to go pretty often. I have been down there a good many times. I don't believe, however, that the water would have been nearly as high on the bridge if we had had as

much of a channel. As to whether they have narrowed up the channel at the bridge by filling it in and taking out two or three spans of the bridge, well, no, I don't know as they narrowed it a great deal. As to whether they narrowed it there by running a grade up closely to the bridge and cutting off part of the bridge, I will say, oh, well, now, that is possible, but the bridge went across the river when they built the approach. I don't think the river was narrowed up enough to affect the flow of the river in the
7514 channel above it. It might have been. As to the fact that you are simply going by what our own citizens have testified, I will tell you: Our citizens testify to a good deal that they don't know much about. I am not going to do so if I can help it; that is, I don't mean that they testified so here, but they talk outside.

Yes, sir, I know of some people attaching islands to their land by artificial means. Yes, sir, that helped to affect the river. That is what narrowed it up, in my judgment, and most undoubtedly when you narrow it in one place you change the direct course of the water. Yes, sir, I know of that being done in the way of artificial narrowing. There is one place on the river where there is an island that was attached there to Mr. Frizell's land in which it seem to me he had thirty-seven acres of land and he gained something over a hundred acres, and that was assisted in attaching to the mainland.
7515 As to my knowing of any other place, I don't know that I can absolutely say that I do. I know of a place here where it was done, but I don't know who did it. Yes, sir, it was done on the opposite side of the river below the bridge. There must be over a hundred acres of land that is now attached to that side of the river that was river bed when I came here. As to whether that was aided in attaching, I don't know how much it was aided, if any. I think it was, however. I never was down to it to see or know. No, I have never had occasion to know whether the level of the ground water rises as you go back from the river—the level of the first water underneath the ground. I have never run any levels on it or anything of that kind. The only level I ever ran on that river or on my farm out here was to see how deep I would have to go. I was generally able—well, I don't know who found it or anything about it, but we could get water anywhere when we got on a level with the river. I did myself. I was civil engineering, yes, to some little extent, but not much. I ran a level from the river to my farm to find out how much higher than the river it was, and it was about forty-two feet higher. I dug a forty-eight foot well and got four feet of water.
7516 No, I didn't run my level at right angles from the river to the well. I ran up the river about half or maybe three-quarters of a mile and struck the river above what would be at right angles. The reason I picked on that particular spot is because it was right where I wanted the well if I could get water; and as to how I happened to pick on that spot at the river, I will say, because it didn't run straight out that way, it ran down the river. As to how I knew it would come out half a mile above instead of two miles, I will say

I didn't want to take the trouble to run two miles, that is all. I think, now, honestly, and have for the last two years, that the water comes from more than half a mile above in the river. I don't think it runs that straight out. I think it works its way out, and the direction of the river above here is such that two miles, as you say, up would come nearer striking the water or the water striking my well coming down the river than it would half a mile. If this water moves along in a way parallel with the river, as to whether it may come almost all the way from Colorado that way, I will say, I think there are people up the Pawnee river here that are using sub-irrigation water that does come from Dodge and Garden City and all the way up there. No, sir, it does not even get back into the channel between Dodge and Garden and their places, because if
7517 the river bends so as to bring that small underflow to the river it would run into it, but it doesn't.

There is high land between the Rattlesnake and the Arkansas, and there are sand banks. No, there is no divide between Coon creek and the Arkansas river. As to there being high land between Coon creek and the river, there is farming land on the river—second bottom. Yes, that is higher than Coon creek, but that is not high land. Oh, certainly, it is higher land. As to there being a dividing point where this water falling on the ground will run toward the river on one side and toward Coon creek on the other, I will say, no, sir, I don't think that is the idea, for the reason that the surface water does not reach, as a rule, in this country, this sub-irrigation. Yes, I think the ground from some certain point slopes toward Coon creek on one side and the river on the other. The water runs
7518 into Coon creek, and it is possible it also runs into the Arkansas river. I think that must be a correct theory. But there is no divide there. It is just common level land, and if any difference it slopes from Coon creek clear to the river. Yes, I think it slopes from Coon creek clear to the river. I do not now remember of a single high place. As to my saying that Coon creek was lower than the river, it is lower than the river up at Dodge. No, I don't mean that Coon creek was lower than the river opposite, at opposite points across, no, sir. It is perhaps not far from a level. That is my judgment. There is very little current in Coon creek as a rule.

As to my having been taking some little interest in this case, I would say, very little. Yes, sir, I was present at the only other hearing that was held here. I wanted to hear what the boys had to say. No, I was not a witness for Colorado, nor for anybody else; but Colorado was taking testimony. As to my advising with counsel for Kansas at that time, I don't think so. If I gave any advice I don't remember it. No, I haven't looked up any witnesses
7519 for him. He wanted to go and see a gentleman and I took him in my buggy and went down there. It was at his request and not mine. No, I have no employment in this case, none at all. By the way, you don't want to forget that I am pretty well

acquainted with the Kansas attorney, and when he came here we talked the matter over and he talked about this gentleman and that living out in the country, and I says "If you want to see him I will just take you down in my buggy." I haven't taken any interest in it. I have not advised with anybody. I have been living here all these years and am only telling you what I judge.

Redirect examination.

By Mr. ASHBAUGH:

About this land between the Arkansas river and Coon creek, as to whether I mean to say there is such a divide as would prevent the water from going from the Arkansas river into Coon creek, I will answer, no, sir, I do not. It is about as level a piece of land as anywhere in this valley. As to whether that is true between the Arkansas river and the Rattlesnake, I will say, no, sir, that is not true, because there is a great ridge of sand hills all along between the Rattlesnake and the Arkansas river. As to the water being able to pass right through under or around those sand hills
7520 to the Rattlesnake (objection), I will say, yes, sir, I think it not only might but does. That is my judgment.

As to the carrying capacity of the river through Pawnee county to carry off flood waters now as compared with its carrying capacity thirty years ago, the water being at the same height in each case (objection), I will say my judgment is from my observation of the width of the river now and then that there is not over two-thirds of the surface of the river bottom to carry off the flood waters that there was thirty years ago. Taking into consideration also the islands in the channel, I will say I didn't take them into consideration in that answer, but then we will include them. And taking the whole carrying capacity, with the water at the same height as to the banks now and its carrying capacity thirty years ago, I will say, through Pawnee county I don't believe there is one-half of the space on the bottom of the Arkansas river bed today that there was thirty
7521 years ago, because thirty years ago I remember distinctly that we could go down and stand where the bridge now is and you could see for miles up and miles down, and now you strike an island before you get your eyes started. It is full of islands.

GREAT BEND, Kansas, June 6, 1905.

7522 W. B. CORNELL, Great Bend, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live at Great Bend, and have lived in Barton county about twenty-five years. I came here on the 16th day of July, 1880, and have lived here continuously ever since. I am in the stock
7523 business and I have farmed some. I have handled quite a bit of stock, and sometimes pasture 1,500 acres of ground of my own, and have often shipped stock. I have been in the mule and horse business for the last few years. I sometimes had pastures north and south of the river. I used to keep up a stock herd west in western Kansas and drive them along. I have handled stock in Hamilton, Ford, Ness, Lane, Rush and Gove counties, and have some stock in Gove county now, and I did my ranging of stock through Stafford, Edwards and Kiowa counties.

As to how familiar I am with the Arkansas river and the lands lying along it, I would say I owned a farm and pasture over here beginning at the bridge on the south. My ranch came up to the river bridge here for twenty-two years, and in fact I still own some land there. Yes, sir, that is just south of the bridge at
7524 Great Bend. It adjoins the city here. I have owned a couple of farms south of the river there yet. As to how often I crossed the river, I will say, pretty nearly every day for a number of years. I suppose I am very familiar with the Arkansas river and the adjoining lands. I saw it quite often. As to the Rattlesnake and the lands along that, why, I am familiar only by buying stock and being down there. I never lived on the Rattlesnake. I have been there a great many times in twenty years, yes, sir, and practically the whole length of it. I have been on the Rattlesnake, I suppose at every point from the head of it up to the sand hills to the south of it. I couldn't tell you about the Rattlesnake rising in Ford county. I don't know just where the line is there. I have been at little ponds there that we called the head of the Rattlesnake,
7525 but I don't know what county it was in. It was south of Kinsley. Yes, sir, I have been familiar with the Arkansas river and the flow of the water during these years I have seen it. I never kept any account of it or anything of that kind. I never took any measurements. Just such as any other person would that owned land along it, I suppose.

As to how the flow of the Arkansas river for ten years from 1892 to 1903, outside of floods, would compare with the flow of the river for the first ten years that I knew it, excluding floods (objec-
7526 tion), I will say, why, that would require a little study, I guess, but it is my opinion that there has not been as much

water regularly going down the river, and I could perhaps in my own way explain my views on that matter. I am not interested one way or the other. As to such explanation, I will say (objection), well, because all of us ranchmen that used to water our cattle at the river and had water fences had to take them away, for one reason, for a number of years. I used to depend on the river for water and had water gaps along the river for a number of years, and we had to do away with these water gaps and put in windmills. Then another reason I could give you would seem to me to show that we didn't have the water: For a number of years this river was boggy. I held cattle along this river for a number of years, and now in places where it used to be boggy farmers cross with loads of wheat when the water is low, the river having become solid. And there is another reason that would be apparent to me; it might not to you: The dry
7527 bed of the river during quite a season has let the wind blow up little islands all along up and down the river, and they have become covered with trees, which they wouldn't have done—they wouldn't have had those islands blown up. This dry sand that has blown off the river has made at least forty acres of land for me, where the sand has blown out of the river and piled up against the bank, and where we used to have a wider channel our bridge is—I can't say how many feet, but a good many feet shorter than our older bridge was. The flow of the river used to require a wider channel, and outside of the floods that we have now the water ordinarily does not require near so wide a bed. As to about when I noticed this change taking place, why, I think I pulled my water gaps out of the river in 1893. I pulled them all down. As to about what time I began to notice these sandbars growing, I will say, oh, much the same time. What trees we have, volunteer trees, along there now are ten or twelve feet high, and there didn't use to be any trees at all along the river. I can't recall very well when there was any along here. As to whether that was about the same time we noticed the banks of the river narrowing and this
7528 land being made (objection), yes, sir, when we had long dry spells and there was no water in the river the wind blew the sand up more. It had more time to blow it up, and of course it made the banks and islands. We have lots of islands here now. We have islands of eighty acres where there didn't use to be any. As to how far up and down the river from Great Bend that condition exists, well, sir, I am not familiar with the river below—oh, five or six miles from Ellinwood, and not much intimately acquainted with it above Dodge, but it does practically exist between Ellinwood and Dodge, yes, sir. As to why those cottonwood trees have grown in the river about twenty years ago, I will say, because where those islands are now—most of those islands were in the bed of the river and have been covered over with water, and when the water came down it would wash the little trees out, and of course there are those little trees that come up at the water's edge every year, but the floods take them out, and those others up on the islands are out

of the reach of the ordinary flood. As to how wide the river is on an average between the banks as compared with what it was when I first knew it, I will say I don't know as I could give you that. As to whether it is half as wide, I will say, the volume of the water
7529 that comes down ordinarily, outside of rain times, is nothing. We use to count on the June fall from the mountains bringing water down, but in the last two years that hasn't cut any figure with us. As to the river being more than half as wide as it used to be (objection), I will say, well, here opposite Great Bend the flow of the water in the summer time is not—oh, it is not a third of what it used to be I wouldn't say, quite a number of years ago. As to how far up and down the river these boggy places extended, I will say, as far as I ever knew it. As to how far back from the river, oh, just in the overflows, in what we call bayous. Yes, right near the banks sometimes. I had one place in my pasture where when we used to have the flow of water that water would come up in the pond or the bog and would rise up whenever the river would come up, and that used to get boggy, and I had to fence it
7530 years ago, and it is half a mile from the river, and in the last ten years I mowed it for hay every year where the river used to be from two to two and a half feet deep. I have pulled many a cow out of it. When it began to get dry—it is half a mile long, I guess, and as wide as this room—and it used to grow cat tails and such things, and for the last ten years there is no water in it and we have mowed it for hay and there is no water in it only in heavy rains. As to where that water came from that kept the bottom moist and under water—from rains or from the river—I will say from the underflow, I suppose. Yes, sir, that was half a mile back from the river. As to other instances that I could state as to how far back the underflow made its appearance in those early years (objection), I will answer, why, we always counted those little springs that came out of our pastures, you know, and our farms, as caused by the underflow. A number of years ago we used to have springs over this country where there isn't any now. I had an elegant spring in the middle of section 3 over here. I came very near putting my buildings there, but the spring is gone now.
7531 That spring must have been 200 rods from the river; I don't know but more. Yes, sir, it is gone. We never see anything of it now at all. As to how many springs around through the country I knew in those early days that have since dried up, I will answer, oh, quite a good many. There used to be a spring over here on this side of Cheyenne bottoms on Mr. Worman's place and we used to get water to drink there for quite a good while, but I never saw any sign of it there any more. As to which side of the Rattlesnake I have noticed springs, I will say, well, down at Mr. Harrison's place on the north side, I think. Well, most of them are on the north side. I don't remember now of but one. There is one down on the south side. There were quite a number of them along the north and west side of the Rattlesnake. The best springs

I know, though, that were on it were down pretty near to the salt marsh. As to whether the Rattlesnake had water in it when the river was up, regardless of rains, I will answer, why, I think those other little streams did, but we had a little creek over here
7532 that ran across the corner of my place that is several miles long—Antelope creek as it is marked on the map. We used to have water in it when we had no rains and had water from above and it used to have water in it all the year round or most of the year, but afterward—as to how it has been during the last ten or twelve years, I will answer, oh, I farm right across there and you wouldn't know there was such a creek unless somebody showed it to you. Yes, sir, I said it had water in it when they had water above, and I mean by that when the Arkansas river came down full of water, yes, sir.

Cross-examination.

By Mr. DAWSON:

I was raised in Illinois and came from that State to Kansas. My parents came there from Scotland. Yes, sir, I have been back to Illinois since I moved to Kansas. I was back at the time of the World's Fair last year. As to whether it is true that in that
7533 part of Illinois where I was raised and in any other country that I know of that has been put in general cultivation many of the springs which were in the country in the early days, and the small sloughs and creeks and bayous, have dried up as they have in Kansas, I will say, not in that part of the country that I came from, because they had twenty-seven tile factories in the vicinity that fixed those sloughs. They drained the country, yes, sir. As to whether I know as a matter of fact that the general settlement of the country and the plowing of it so that the soil absorbs more of the moisture and holds it rather than carrying it on the surface tends to dry up the small streams and springs of the country, I do not know, sir, in regard to that. I couldn't tell you. I have argued that here with our people and they tell me the more you plow it under the wetter it gets. As to that being my view when I was arguing it with them, well, I have always thought that as far as the surface of the land was concerned that stirring and plowing it would make it drier, but in regard to the springs that came down in the ground, I couldn't see how that would affect that spring. As to whether most of those springs and little creeks I spoke of as drying up on my place were little surface springs or creeks and didn't come from any subterranean or artesian flow, I would say, no, I suppose the water comes from some underflow that goes down to it until it strikes a stratum or something. Taking for instance
7534 the Missouri river, as to whether I know that even that large stream has grow up or filled up more with sandbars and that it is much less navigable than it was twenty-five or thirty years ago, I would say, yes, sir, I have noticed that, and I guess all streams

are so more or less—western streams. As to how the streams were in the Illinois country with which I am familiar, I know they look smaller to a fellow when he comes back. I don't know whether they are actually smaller or whether he is used to a bigger country. As to what I meant by not being interested in this matter, I meant that I take no interest in public affairs whatever, politics or anything. I never bother with them. As to whether this land where this little creek is dried up is just as valuable to me now, dried up and farmed, as it was before, I will say when I am farming it is, but when I had the stock on it I wanted the water. Land is
7535 more valuable to raise wheat on than to raise stock on, because a man can't afford to pasture cattle there at present on land that will raise wheat at the price it is now. Yes, sir, about half of the land I have over there will raise wheat. As to whether that land is as valuable to me today on the market, other things being equal, as when that little creek was there, I will say, well, I could answer that yes and no. Wheat land is more valuable because wheat is at a better price, but the hay land doesn't produce as good hay as it did in the years when we had water in the river. I have cut on the north half of section 3, a good many times, three and a half tons to the acre, and sometimes more, which we don't get any more here. Last year I didn't cut hay on it, but I don't think it was as heavy. Another man cut it last year. As to whether we
7536 had a good flow of water in the river last year, well, it came at a time when it didn't do the hay any good, it came so late. We generally cut that hay in August or September, and our high water didn't come until September last year. As to whether I mean the rains didn't come or the high water in the river, I will say, it doesn't make any difference either way. That land I had across there is what they call sub-irrigated land—second bottom land. It is not very much above the level of the water in the river at the ordinary stage. Mr. Duncan raised some with me there once and took the levels for me when I had the irrigation fever, and I think it was about eighteen inches. Yes, sir, the second bottom, about eighteen inches above the ordinary stage of the water in the river. And the first bottom was under the river when it came up, a good deal. I have had the water run across that land one time. As to whether the first bottom land becomes any more valuable for any purpose by reason of less water in the river, I think the pasture land we
7537 now have used to be in the bottom of the river. I have perhaps forty acres of made land that used to be in the river and pay taxes on the Government survey of—on one little piece across here, I think the Government survey calls for 76 acres and I am satisfied there is 150 acres in the tract now. As to whether I have known of any people up and down the river assisting nature in attaching these islands to the mainland by throwing in brush or hay or anything in the little channel between the island and the mainland, I don't know personally that I do. I knew of a man who acquired some land down the river here, but how he got that I couldn't say. I

was not personally acquainted with him. I know that after the stage of the water lowered in the river he came to the United States court and undertook to homestead it and he got the land. As to whether I ever attached any land to my premises in that way, I will say, no, sir, I never did. What land came to my place naturally blowed out there and piled up. Yes, sir, there is a great
7538 amount of plowed land up and down the river along my country, near the river. As to whether when the wind blows sometimes in the spring it blows a lot of that sand into the river as well as blowing some of it out of the river, I would answer, it wouldn't along the river here because there is timber all along. Yes, sir, it blows on the edge of the river on both sides. The way we are farming it, we don't let it blow much. The farmer used to think he had to burn all the stubble off his ground to get more wheat, and now the more trash he gets on it the better.

As to how the flow of the river in the last ten or twelve months, on the average, would compare with any other ten or twelve months that I ever knew it, I would say, we have had more water in the river this last September perhaps than any other year I can remember since 1884. As to whether my little creek started to run again on this place that I said used to run over there, well, I haven't been over there. I haven't noticed much about that. I haven't been on that part of my farm this spring, but I went along past a farm I rent out and I noticed the water standing in the corn fur-
7539 rows. As to whether I consider on the whole that I have been injured, benefitted, or whether it is an even thing by reason of having had less water in it, as I say, for the last ten years, my hay meadows—a man who has land along the river bottoms depending on hay—as to whether I have been injured or benefitted or whether one about off-sets the other, I would say, I never paid any attention to it. I don't know as it makes any difference to me as far as I am concerned, individually. As to whether there has really been enough injury in it to attract my attention or for me to take any particular steps or interest in this litigation over the waters of the Arkansas river, I would say, I was interested in it as a citizen of the State, but then it was all politics to me and I let it go. I never paid any attention to it. I have come to the stage where the common people, I think, haven't anything to say. I never engage in politics in any way, shape or manner, and never want any office and don't care anything about it and don't care who has them. I thought there was a good deal of buncombe in the matter, to get some good fees for lawyers. Yes, sir, that might apply to
7540 Colorado just as well as to Kansas—the whole business. As to whether I know that Colorado did not bring this suit, I will say, I don't know anything about it.

Cross-examination.

By Mr. CAMPBELL:

7541 That land I was speaking of on the river I have owned perhaps twenty-two years. Why, no, sir, I don't consider that land is worth any less today than it was twenty-two years ago. It is worth a good deal more. Well, no, sir, I haven't been injured by reason of the flow of the river having become less. So far as the run of years is concerned, a man wouldn't be injured. Buying land and selling it at $25 an acre wouldn't injure him much.

7543 C. Q. NEWCOMB, Great Bend, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I am eighty-two years old and have lived in Barton county twenty-six or twenty-seven years, and my business has been surveying and civil engineering, more or less, and farming. I have lived in Great Bend about tweny-four or twenty-five years and have been surveyor of Barton county eight or nine years and have been following civil engineering ever since I was nineteen years of age. Yes, sir, I have become somewhat familiar with the Arkansas river and other rivers in Barton county as a civil engineer and surveyor in this county, and am fairly familiar with the lands of Barton county.

As to how the flow of the Arkansas river, outside of floods, for the last ten or twelve years, from 1890 down to 1904, compares with the flow of the river during the same part of the year for the first ten or fifteen years that I knew it (objection), I will answer, why, I have considered that there was considerably less water in the river during the latter ten years you speak of. As to why I think so,

7544 it is from observation partly and partly by measurement. I have established bench marks and measured the water—the underflow—at different places between here and the river, and by "here" I mean the commercial rooms in the city of Great Bend, and this is about half a mile from the Arkansas river. As to

7545 whether I have noticed any changes in the river, I will answer, well, there are different formations in the river, and sandbars more or less, and some small islands. These sandbars and islands are more numerous and larger now than they were in the earlier years. As to when I noticed these sandbars on these islands increasing in number and size, I will say, oh, they have been increasing for ten or twelve years more or less. No, sir, the river banks are not as wide as they used to be. It is contracted a good deal. I can't say how much exactly, but considerable. I have noticed that. As to how the carrying capacity of the river now would compare with the carrying capacity of the river in the

early years, the water being at the same height as measured from the banks, I would answer, of course it is slower, and there are little streams and chains which divert water from one side to the other, and it is first on one side and then on the other, and of course there couldn't be and there isn't as much water in the river as there used to be. I can see that plainly enough.

But the carrying capacity of the river to carry off flood waters
7546 is not as great today as when I first knew it (objection), because it has become filled up by sediment by filling in here and there and is choked up a good deal. This has been evident for quite a number of years. Yes, sir, I have been in Colorado and have seen some of the irrigating ditches. As to what effect the taking of water from about 1887 to 1892 in Colorado for irrigation purposes had upon the flow of the river through this part of the State

of Kansas (objection), why, to subtract the water from the
7547 river up there would lessen it here, as a matter of course. And it did do that, yes, sir. As to what I consider the cause of the growing of the sandbars and those islands, I will say the lessening of the velocity of the water, and as a matter of course lessening the volume also. Yes, sir, there is a less velocity and also a less volume. (Objection.) The velocity will be the square root of the

depth, and the depth is a great deal less. As to the islands
7548 and the sandbars becoming grown over with trees in these later years, I will say there are quite a number of trees springing up on the different islands. As to why these trees didn't grow in the channel of the river during the earlier years (objection), I will answer, there were no islands there. They were covered by water too much and the trees and vegetation couldn't grow. As to why these trees have grown up in the river, I will state, it is because the water has receded from the surface so much, and it has lessened in depth, and it gives them a chance to grow and the seeds will catch on and grow in the sub-soil where it is dry to a certain extent. As to whether there was sufficient cottonwood seed along the river here in the early years to seed the islands if there had been any, I will answer, most undoubtedly the trees would put off seeds. There were plenty of trees here along the border of the river, but there was no chance to catch much in the bed of the river, and the seeds would be carried away and carried down below.

As to how far back the underflow I spoke of extends from the

Arkansas river (objection), I will answer, why, that depends
7549 upon the level of the ground a good deal. Where it could be discovered I can't say. Perhaps half a mile or more. But I find it has receded, that underflow, two or three feet or more. About a quarter of a mile from here, we will say, I have found that the underflow has lowered two or three feet or more. Right southeast of here I have a bench mark and have measured the underflow from that bench mark, and another one in the west part of the city where I have measured the underflow and found it to be, I think, some 2.8 feet at one time and at another time a little exceeding it,

down below. Yes, sir, 2.8 feet lower than it had been prior to that. As to how I account for that lowering of the underflow, I will answer, by this water in the river.

Yes, I remember the bridge that is now across the river at Great Bend. Yes, sir, as to those islands there now, I will say there are islands there, what may be termed islands—sandbars. During
7550 the early years there was quite a free flow of water under that bridge, years ago. Yes, sir, I think the receding of the waters in the Arkansas river is what has caused the lowering of the underflow here. As to what further facts lead me to that conclusion, I will answer, the fact of observation in general and measurements in particular has led me to that conclusion. Observation in general everywhere. It is obvious that there is less water in the river. Yes, sir, I have noticed that from wells. I put down a well at my place down southeast from here about a quarter of a mile and between here and the river. It was about six feet to water then, and I have to go nine or ten feet now—nine feet I guess, or about that. As to what I consider the decreased flow of the Arkansas river in these later years and the consequent falling of the underflow, I will answer (objection), well, I have supposed it to be and have be-
7551 lieved it to be simply the diversion of the water. Taking a part of it away would naturally, as a matter of course, lessen the quantity, and I don't know how to attribute it to anything else.

Cross-examination.

By Mr. DAWSON:

As to whether I know as a matter of general reading and observation that it is the history of practically all rivers that as the country is settled up and put under cultivation the streams to a certain extent lessen, small springs dry up that formerly existed and small brooks practically disappear, this being the history of this and other countries, I couldn't say that I believe that to be true, no, sir. I came from Michigan here. I was in Michigan a number of years, and I can't say that I believe that small springs and streams have dried up in the States of Michigan, New York and Pennsylvania that in the early days existed and were constantly flowing. They might in the course of thousands of years be less a little, but hardly perceptibly so.

7552 As to whether the run-off from a plowed field, the surface run-off that goes to make the stream, is as good from that ground as from sod, I have no doubt that the river, if depending on the surface water,—it might make a difference. As to whether all rivers depend largely on the surface run-off or rains, I will answer, I can't see that they do so very largely. No doubt it may be true of a river which runs through a mountainous country that a great percentage of the rain which falls upon the ground in its immediate vicinity gets to the river in surface run-off rather than from percolating waters from the soil. We have water sheds and the water

runs off those water sheds into the streams. No doubt of that. That is true, probably.

7553 As to whether this river is being narrowed by the help of man, as for instance the abutments or approaches to the bridge here have been carried out into the river so as to shorten the bridge, I will say, probably just at the ends of the bridge they have had to protect the abutments a little and build it so as to divert the water from the abutments. As to whether in the real construction of the bridge and afterward in its improvement they have no- encroached upon the river by crowding the approaches out into the natural channel of the stream, I think not, only for a temporary purpose just to keep the water from washing the——

As to whether I have known any of our citizens here attaching islands to their land by helping to close up the small channel between the island and the mainland, I don't think it has been done to any extent. There was one man attempted it, I remember, but I guess he never accomplished anything.

Yes, sir, I have kept measurements of the surface flow of the Arkansas river. I have done it many times. For what purpose, I will say, at the time I made a survey of the ditch from above

7554 here eight or nine miles above the city I measured the flow of the water in the river several times. I have forgotten now what it did flow per second exactly, but I measured it and recorded it. I guess I surveyed that ditch fifteen years ago, and subsequently my son made a survey. He made a survey three or four years ago. As to whether any of these ditches were built, I will say, the latter one was partially built. It was to take its water from the Arkansas river. They got a little water, but not much. No, sir, I don't remember exactly what the river did carry when I measured it, but it didn't carry enough to do much good anyway, even to this last ditch that was built. Yes, sir, I measured the river in the earlier years, prior to fifteen years ago. The reason I measured it

7555 then was because I was doing business in that line. I was a civil engineer and I measured it because some people wanted it done, and out of curiosity I measured it during its natural condition, when it was at its ordinary stage, and during the flood also, to see what velocity it had—both velocity and quantity. No, I don't remember the quantity now. I think on one occasion I measured it for somebody. I reduced it to so many cubic feet per second of time, yes, sir. No, I don't remember what the amount was. I could ascertain and let you know if you desire.

I was here in 1876 and 1877. I got moved out here I think in the winter of 1877–'8. I don't think the river here went dry in the late summer and fall of 1877. I don't remember distinctly.

7556 We were not any more than just located here at that time. As to whether the river went dry in the summer and fall of 1879 and continued dry a good part of 1880 near Great Bend, I will say, I think not dry. I don't know but there might have been less water. It was not until several years afterward that I took so par-

ticular an interest in things of that nature here, because I was then conducting a ranch and farming it, but a little later on I did—— I am quite sure it didn't go dry in 1879 and 1880. I feel so anyway. I know there was plenty of surface water all over this county when we first came here and for a year or two afterwards. Well, I can't say all over the county, but the Cheyenne bottoms were covered, and it was covered more or less—there was water for half a mile from the river that came up on the surface. There hadn't been any flood at that time. The flood waters that came
7557 down didn't come as early as that. That was in the early years that I speak of. No, sir, I don't know that the river for the last two months has been running a good, steady, full stream all the time. I guess there is considerable water today. There nearly always is considerable water about this time of the year flowing from the mountains. It has been about ten days since I saw the river. As to whether it was flowing a good stream of water then, I will say, a little water in the river. As to whether it was not flowing a good stream, practically the whole bed of the stream covered and with a channel two or three feet deep, I will say, the water has gone down, it is true. No, sir, it has not been coming that way for two months past without a single break, not here at Great Bend. I think not. It has been up and down, up and down, up and down.
As to how long it would take a rise in the river to affect
7558 this ground water I speak of back here in town, I would say, it wouldn't take very long. The underflow is exceedingly slow, of course, but it gradually rises to about the same level as the river. That is the way it is. But I don't know exactly what length of time. I expect it would take it some weeks anyhow to affect it back as far as our court house here in Great Bend, and that is about half a mile from the river. No, that estimate is not based upon my observation. That is a mere guess. I don't know about that. I have never tested that to see what velocity the underflow would have. I have measured the velocity of the underflow here at different places, but I don't now remember. It was generally from east to west I measured to ascertain, but I found it exceedingly slow. It would take it quite a good while, probably two or three years, to run from Colorado, probably. I don't know. It is hard to tell.

If it be a fact that the Arkansas river has had as good an average flow for the last eight or ten months as it has had in the earlier years for a like period of time, as to how I would account for the fact that it has not raised the level of the underflow to its
7559 normal position as I found it in the earlier years, I would answer, I couldn't account for it unless it is because less water may have been used in irrigation ditches. I should suppose that to divert water from the river anywhere in the west would lessen the flow here. As to why it has not brought the underflow back up that three feet I said it had fallen off, I will say, I haven't measured within several years now the underflow here, but I have measured

it in times past. I don't know how the underflow would be just at this present moment, but if there has been such a flow of water in the river as you speak of here I should think it is because the water has not been diverted from the river at any point. I think

7560 it was two or three years ago that I measured the water. I didn't understand you to mean right now. As to whether I do not know as a matter of fact that the level of the ground water is the same here today as it was twenty years ago. I will say, I know that to all intents and purposes it is lower down, because it couldn't be any higher, surely. It may be said, perhaps, that I don't know that fact, because unless it might be a miracle perhaps, if it should be any higher. I have measured it when it might have taken nine feet to reach the water when I had before found it at six. No, sir, I haven't measured it in two or three years. As to whether I just take the supposition that the taking out of water in Colorado will make the flow less, I would say, it would be very paradoxical if it didn't. It would be absurd.

7561 Q. Do you happen to know that this stream differs very much from the kind they have in Michigan and that country and that it has been the history of this river from 1806 at least, when Pike went up the river, that there has been a strip of 150 to 200 miles where the flowing water in the stream has practically disappeared for some months or evaporated or gone somewhere in every year since that time? (Objection.)

7562 I am acquainted with the Flint river in Michigan, the Saginaw river and other waters there. I have found the waters in those rivers just about uniform in velocity of flow. Once in a while there would be a little flood, of course. That is an exception. But they are uniform in——

Q. That is not what I asked you.

A. Well, I am going to get around to that. That is what I know of those rivers. The water in the Arkansas river I am acquainted with somewhat and I have found that to be very variable and that it is less now than it was years ago. But you speak of comparing the two places. In Michigan there is a greater uniformity in depth and flow of the water.

As to whether that was true before there was irrigation on the Arkansas river, I will say, comparatively. Maybe there was some difference, but I know there is vastly less water in the river today than there was years ago. There can be no mistake about that, because that is too plain to be denied or disputed. The water has been subtracted from the river in different places, and of course that makes it less. As to whether it is largely a matter of reasoning with me, I will say, why, yes, partly reasoning and partly knowledge of the facts.

Yes, sir, I know something about seepage or return waters and what percentage of the water spread upon the ground for irrigation on the water shed of a stream gets back to the stream. I

should think there was a very small per cent. gets back.
7563 When the ground is broken up and cultivated of course it absorbs the water. I think the percentage is mighty small. Maybe there would be ten or fifteen per cent. got back to the river if the irrigation was done close by the river, but if it was done far away very little if any would get back to the river. None worth mentioning. Yes, sir, I have done some irrigating. Not on a large scale. I have computed some work up in Colorado that has been sent down to me for computation. I have computed the flow of the water in different ditches there for parties who have sent their work down here, and I have been up there to see them, and have been to Garden City, but I can't say exactly what percentage of the water would ever return to the river. Not much anyway.

Redirect examination.

By Mr. ASHBAUGH:

7564 When I answered concerning the condition of the river "now" I didn't mean on this 6th day of June, 1905, no, sir. And when I spoke of the underflow being lowered before, I will say I have frequently measured it, and measured it some years ago, and measured it several times, and I think it is some two or three years since I did measure it, and that was before the higher water of the floods in 1904 and the high water in the spring of 1905, yes, sir. (Objection.) During the month of October, 1904, there was considerable water in the river then—floods. Yes, sir, that is when the Santa Fe track was washed out up in Colorado.

7566 G. L. CHAPMAN, Great Bend, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Great Bend, Kansas, and have lived here about thirty-two years. I am a banker—president of the national bank here. I have been in that business twenty years, and before that was in the postal service. I am at the present time State senator for this senatorial district, comprising Barton, Rice and Stafford counties.

As to my being acquainted with the Arkansas river for the last thirty-two years and the lands in Barton county, I will say,
7567 well, I have been about the river more or less during my residence here in Great Bend. Yes, sir, I have paid such special attention in one way and another to the river and to the lands adjoining it that I can say I am familiar with it, and with the bridge across the river here at Great Bend. My acquaintance extends two or three miles up and down. Yes, sir, I have travelled a good deal in one way or another and see the river from the Santa Fe train from Great Bend to Hutchinson at one or two points. Yes, sir, you can see the river right on the other side of Ellinwood. I should think the Santa Fe track was one or two miles back from

the river along those places. I have crossed the river at the rail-
road bridges in this part of the country and have crossed
7568 the Santa Fe railroad bridge just west of Kinsley on the cut-
off and at the other end of the cut-off near Hutchinson, yes,
sir.

As to how the flow of the river for the last ten or twelve years, prior to 1904, excluding floods, would compare with the flow of the river, excluding floods, for the first ten or fifteen years that I knew it (objection), I will answer, well, my recollection and knowledge of the river from 1872 up to ten or fifteen years after that time is that we had a great deal more water in the rive than we have had in the last ten or twelve years. As to what facts and observations I base that on, I will answer, well, about the only reason I guess I could give for that is that the water must be taken out of the river somewhere above us. As to what facts and appearances and conditions I had in mind that led to that statement, I will answer, well, that
is the amount of water that flowed down the river, and in
7569 judging of the amount of water that flowed I take into con-
sideration first the last eight or ten years. There has been a very small stream of water running down the river, and of course I judge, necessarily,—that is, judging by the former years, in the early days here—that there must be water taken out of the river above us somewhere. As to whether the river is as wide now as in the early days, I will answer, no. I think the river about—I was across the river yesterday, up the river, attending a sale up there, and the river is now just about one-half as wide as it was in 1873 and 1874, I should judge. As to what other changes I have noticed in the channel of the river, I will say, well, I notice the river is being filled up largely by sandbars, and of course I presume that comes from no water flowing down to keep this dirt and stuff that blows in there
from filling in. As to the river bed now being more largely
7570 covered with sandbars than in the early days, I will answer,
oh, yes, in the early days my recollection is that there were only two sandbars—one down the river and one up the river. That was perhaps within a quarter of a mile of the bridge. They were the only two sandbars in the river at that time. No, my recollection is that those sandbars had never been covered—that is, totally covered. As to the trees growing on them in those early days, why, nothing but some willows and things like that. Not very much trees to speak of. As to the condition of the river at the same place now with respect to sandbars and islands, I will say, well, I find that it is partly filled up. There are sandbars all over the river both above and below the bridge, quite large ones, and these have increased in number and size, yes, sir. I notice that there is now quite a large number of cottonwoods on those sandbars or islands, and that is plainly visible from the bridge, yes, sir. That bridge
was built in 1882 or 1883. Yes, sir, there had been
7571 a bridge here before that at the same place. As to
whether the bridge as built in the first place had sand-

bars under it so as to obstruct the flow of the water through any of the bents of that bridge, I will answer, it did not. As to how it is now, well, there are sandbars, I believe, right under the bridge now, under perhaps a couple of the bents anyhow. I have never observed closely enough to see the number. I believe there is a sandbar right under the bridge at the present time, in the middle. I think it is quite a wide one, yes, sir. No, sir, that sandbar wasn't there twenty years ago. As to whether that sandbar is high enough so that at high waters this spring it has overflowed under the bridge, I will say I don't know. The river has been up quite high and it looked to me like perhaps the river had been over that sandbar.

7572 As to the carrying capacity of that river now as compared with its carrying capacity in the early years, the water being at the same height as measured from the banks, I think the capacity now is much smaller than it was years ago. I couldn't say to what extent, but it has been reduced very materially. As to how long it has been since this change took place, I should say, well, I should judge along there after 1890 some time. I know at the time this bridge was put in there were only two sandbars in the river—one perhaps a quarter of a mile up and then there was another one down the river. I have not crossed the bridge above Kinsley I suppose since ten years ago. I crossed the bridge down at Hutchinson last fall. As to the appearance of the river today or within the last two or three years at those places where I have crossed it, as to islands, trees and sandbars, they seem to be increasing, and that is true from Great Bend to Hutchinson, or from Kinsley to Hutchinson where I have seen it that condition exists now, yes, sir, all along.

7573 No, sir, that condition didn't exist thirty years ago as I knew the river. As to what I consider the cause of that change (objection), I will answer, well, I attribute the cause to the lack of water flowing down the river. As to what causes these sandbars to grow up with trees within the last ten or fifteen years, well, because there was no water there to keep them washed out. As to how far back from the river the underflow extends (objection), I will say I don't know. I know that up where I live here on Broadway I should judge the underflow reaches

7574 back that far from the river, and that is three-quarters of a mile from the river. Yes, sir, it is more than 500 or 1,000 feet from the river. As to what evidence I have that the underflow extends back that far so that the amount of water in the river affects the level of the underflow at that distance (objection), well, I base my opinion on this: in digging a cess-pool—I dug two cess-pools on my property, and I can tell from the amount of water at the different times I dug those pools that the water had either lowered or raised. As the water in the river would be either lower or higher, yes, sir. (Objection.) When it would go down it would go down deeper, but when the water in the river would come up it would rise. Yes, sir, the water would come up in the cess pool after the

water rose in the river, and when the water went down in
7575 the river it lowered in the cess pool. I observed that, yes, sir, and that is three-quarters of a mile, or a mile, about, from the river. As to whether I ever noticed that same fact from any cellars in this city anywhere, I will say, only from what people have told me that live over in the 3rd ward, that is, over in the southwest part of the city. Of course I have no personal knowledge, only having heard people speak of it.

My knowledge is not very extensive on the south side of the river and along the Rattlesnake. I know but very little about there. Of course I know the country and have driven across there, but don't know anything about the condition of the rise and fall of the water.

Cross-examination.

By Mr. DAWSON:

7576 No, sir, I was not a member of the legislature when the bill authorizing the suit by Kansas against Colorado was passed. That was taken up two years ago, I think. I became a member on the 9th day of January, last. Yes, sir, I was one of those who supported or helped pass the bill making an appropriation this last winter for the prosecution of the suit. As to whether I ever discussed the suit or had any talk with reference to it prior to my going into the senate, I will say, I never talked the matter over. I never took any active part in furthering this suit in any way.

No, sir, I am not an owner of farming lands in this county, nor have I any farming lands along the valley of the Arkansas river in this State. No, sir, I own no farming lands that are not on the Arkansas river. I own no farming lands at all.

7577 I represent a company that loans money on farming lands along the river, but the national bank of which I am president don't make any loans on real estate. No, sir, the changed conditions of the river of which I have spoken have never led our company to be any less ready to loan upon the valley lands along the Arkansas river. That point has never been raised. As to the value of farming lands in this county along the valley of the Arkansas river now as compared with the former period when I knew the land, I can't say there is very much change. That is, the lands have all raised in valuation. I can't say that the land along the river has raised in value more than the uplands. No, sir, they have not depreciated any or gone down along the valley in late years. The valley lands, of course, along the river have always commanded a very good price. No, never any better price than they do now on the open market since I have been here, not that I have any recollection of.

7578 No, sir, I never attended any of the meetings or helped to agitate the question of the bringing of this suit prior to its

commencement. I never participated in any. As to whether I ever heard any general complaint, say two years before the commencement of this suit or prior to that time, well, yes, in a sort of general way I have heard people just simply make passing mention of it, that if there had not been so much water taken out above us we would perhaps have more down here. They were not making any great demonstration, of course, only in a general way. As to whether it has been a matter of general information through this section of the country for the last fifteen or twenty years that Colorado was engaged largely in the construction of irrigation plants and the redemption of arid lands, well, not as far back as fifteen years. Perhaps in the last eight or ten. But I don't know that the statement was made that it was taken out to irrigate arid lands, but that they were simply using it for irrigation purposes up there. Yes, sir, it was known that the country to the west on the Arkansas river, in Colorado, was irrigating to some extent as far back as ten or twelve years ago anyhow. Of course I couldn't say how far it dated back.

7579 I came to Great Bend when I was four years old. That was in 1872.

As to whether when I stated that the average flow of the river, excluding flood periods, for the past ten years has been less than the average flow, excluding flood periods, for the first ten years, I was comparing a man's notion of the river with the notion of a boy between the ages of four and fourteen, I will say no. The only way I compare it, I know there was never a winter passed that I was not down on that river skating, for at least ten or twelve years before I got into any kind of business, and in the summer months I think I must have put in three or four hours a day down there swimming, and I remember time and again we used to get up on the bridge and dive right down off the bridge, summer in and summer out, and I think a fellow would break his neck if he should dive down there now. I wouldn't want to get up on top of that bridge and dive down now as I used to. As to whether I am probably more cautious now, I would say, I don't know where the deep holes lie like I used to. I venture the assertion that a person could go across there and there would perhaps be only one or two holes over your head across the bridge. As to comparing a man's

7580 recollection of the last ten years with the recollection of a boy of from four to fourteen as to the first ten years, I will say, no, I never got into that river when I was four years old. Yes, sir, I said I came here when I was four years old. Yes, sir, and in answer to counsel for Kansas I said that the average flow of the river for the past ten years, excluding flood periods, has not been nearly as great as for the first ten years I was here, and the first ten years was the period when I was between the ages of four and fourteen years, yes, sir. Yes, sir, then I was comparing the recollection of a man as to the last ten years with the recollection of a boy between four and fourteen years of age as to the first ten years.

7581 As to how deep I went to strike water in the cess pool I spoke of or how near the surface the water came when the river was up, I would say, about eight feet, I think. Yes, sir, that was on the first bottom. And as to how near the water would come to the surface when the water was up in the river, I couldn't say as to that. I just noticed in the bottom of the cess pool it was maybe two or three inches or something like that. I don't recollect whether I noticed at the same time or maybe weeks before that that there had been large rains in this country when the water would come up in these cess pools. Of course I know that the hole was dug and it was put down into the sand. We get water here, that is, up on the road, right down in the sand, and I remember at the time the hole was dug I told the man to go down so that the water would come in, and I noticed just at that time the river was up and it came up maybe three or four inches. Now, I don't recollect—there might have been rain north. I couldn't say as to that. As to whether I have any definite knowledge as to whether the river supplied that water in the cess pool or whether it was simply a coincidence and that possibly the same cause which produced the high water in the river also produced the water in the cess pool, I will say, well,

7582 of course there might have been heavy rains west or north somewhere that caused the river to come up, but you take it in this country and what knowledge I have when the river gets up like it is now or has been is that it comes from rains up in the mountains, or the snow, because the river very rarely rises from heavy rainfall around this section of the country. It is generally from up in the mountains. Yes, sir, the same general cause which might produce the water in the river might have produced the water in the ground. It might.

Yes, sir, this country is as prosperous now in the immediate vicinity of Great Bend as it has ever been since I have been here, and I guess for the past few years, perhaps.

As to whether, outside of those farmers who may take an active interest in politics, in general along the river valley in this locality the farming community shows any interest in this suit as a matter of general discussion, I will say, there isn't very much dis-

7583 cussion about it. The only thing, in talking with the people along the river,—of course we haven't had very much rainfall here. This is about as dry a spring as we have had for quite a while, and fellows along the river are making no complaint about dry weather because they claim the river has been up this spring and what they call the underflow is giving them plenty of moisture. Yes, I presume up west of here, in other parts of the State, I know of their having had almost excessive rains. Up west about Dodge they tell me they have had an abundance of rain up there.

As to whether it is a fact that since the country has been generally put under cultivation and during dry periods and when there are high winds a great deal of the dirt and stuff from the plowed fields blows into the river that did not blow into it when the coun-

try was covered with its native sod, I hardly think the way the winds blow in this country it has brought it out around the roots of the grass, but I think on these sandbars these trees grow up and naturally hold it there. To be sure you can blow a great deal more dirt off a plowed field than if it were covered with sod. I don't know that it is true that the run-off from any given area of cultivated land is less than on the same ground covered with sod—the
7584 surface run-off. I should think that off the plowed ground perhaps the run-off would be more. Yes, the breaking up of the sod makes the ground absorb more, but at the same time if there was a big flood or anything it would naturally carry that loose dirt away. Yes, every small, slow rain, of course, would be absorbed. I don't think there would be any run-off.

As to whether I know of any people along the river here capturing any of these islands by assisting nature in attaching them to the mainland by the filling up of little channels between the island and the mainland, I don't know of any cases of that kind. I have had no personal knowledge of them.

Yes, sir, the abutments of our bridge or bridges have been carried out into the river; that is, when we built the last bridge, the second time it was built shorter than it was at first and narrowed up the channel. I think they tried to change the channel of
7585 the river, and I believe it was filled in there. I don't know about these sandbars under the bridge, as to forming around the piling where a little driftwood catches and holds, furnishing an excuse for the starting of sandbars. I noticed one yesterday that was built away out, so that I don't think that would occur that way. Of course it might. I couldn't say whether it started by the obstruction furnished by the piling, the debris drifting and catching onto it. I have never noticed much drift around the piling there. Yes, sir, this is just an ordinary piling bridge. It is iron or steel that is put down. There is not much drift coming along this river; is *it* all small stuff so that the piles simply cut it and it goes on down the river. No, I have never noticed brush and grass and stuff washing down and collecting on the piling and being held there. I have never noticed a thing there. I noticed one thing yesterday, that this sand bar extended under the bridge, and that if the water would run like that for three or four months there would be no sandbar there, because I noticed it is cutting out right along. There
7586 has been a pretty good flow in the river for the last two or three months—all spring. I couldn't say whether there was a pretty good flow all winter and last fall, from last August on, because I wasn't around the river much last fall, in fact I don't believe I drove across it. I was working around in north, and I crossed the river once. There was a pretty good flow there, but nothing like it is now. Yes, sir, for two or three months past we have had a pretty good flow there.

Redirect examination.

By Mr. ASHBAUGH:

As to the flow of the river from 1893 to 1903, as compared with the average flow from 1883 to 1893, I will say, the flow along in 1893 for three or four years there was very low. There was
7587 very little water in the river for three or four years. Perhaps sometimes there was not a bit of water running down the river. No, sir, my recollection of the river from 1883 to 1893 was not the recollection of a young boy. I was around about twenty years old. I believe in 1886 there was very little water came down the river—very little. That is my recollection.

7588 J. B. MILLER, Great Bend, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live at Great Bend, Kansas, and have lived here over thirty years. I came here in May, 1872. My business has been various. I have been a photographer and in the livery business mostly, in carpenter work, and a merchant. Yes, sir, in 1872 I and another man ran a ferry boat, or rather a pole boat across the Arkansas river for carrying passengers and stuff across the river here at Great Bend. There was no bridge here then. That boat was 8 x 16, the best I remember, and large enough for ordinary ferry pur-
7589 poses at that time. Yes, sir, I have known the river mostly since that time. I have lived here most all the time.

As to how the average flow of the river, exclusive of floods, for the last ten or twelve years from 1890 down to last year, compares with the flow of the river for an equal number of years during the early years, exclusive of floods (objection), why, the flow is lighter. I think considerably lighter. Yes, sir, I have noticed changes in the appearance of the river. It has been forming land on both sides, that is, in places, sometimes one side and sometimes the other. I don't know how far this extends up and down the river. I am not much acquainted with it only just close here, but that
7590 does extend three or four or five miles. No, sir, the banks are not as wide as they used to be. I owned a mile of river front just opposite here, and when I bought it I bought sixty-six and a fraction acres and today there are over 200 acres in that same mile strip. That land increased by the sand forming and the wind blowing it up and forming land, and the river narrowing. I have noticed another change; that is, the channel is not as deep as it used to be. As to why not, it has filled up with sand and islands and sandbars. As to what has become of those sandbars after they had once formed, they have grown up with cottonwoods. That condition extends up and down the river here for three or four miles. I hardly know exactly how long ago it was that these sandbars began

to form in the channel of the river and to grow up with
7591 trees. That is something I haven't kept any account of. But ever since they put in the new bridge, in 400 feet narrower than the old one was, it has been forming islands more than it did before. I can't remember just when that was. As to why these islands have formed and the sandbars in the channel of the river, I suppose it is from the lack of water. There is an island down there at the bridge at the present time, yes, sir. As to what effect this flood that is in existence now has upon that island, the city officials or the county officials ordered the timber cut off, on account that the water washes through and is cutting out a good deal of that island. Yes, the high water at the present time has been washing that island away, but I think it is on account of the timber being cut off. I can't positively tell how long that island has
7592 been there, but eight or ten years anyway. And the trees have been growing on it just as long as the island has been above water. That is true of other islands along here.

As to whether I know anything about the underflow, I will say, no, sir. I know there is an underflow; I know that. As to what makes me think so, I live right over this divide here, and when the river rises the water rises in my cellar. That cellar is just a block north and a block west of the Commercial Club rooms here in the city of Great Bend, and it is just about a mile from the river. Yes, sir, I say that when the river rises the water comes into my cellar, and that does not run in from a rainfall from the surface. It runs in from beneath—the underflow does. The other cellars are about all that way, all over the city.

7593 Cross-examination.

By Mr. DAWSON:

Yes, sir, I have got water in my cellar now and this has been in about a month, ever since the first high water came up. Yes, sir, I think there has been a pretty good flow in the river for six weeks, somewhere along there. As to how long it takes after the river rises for the water to show in my cellar, I would say, generally about six to eight days. I am on rather low ground. Yes, sir, there is an old slough or swale or channel that comes in back here in my neighborhood showing that there might have been an old channel of the river through there at some time ages ago. Yes, sir, right there at my place. There is a kind of low place between here and—and then about half a mile farther north there is another little rise, and I am on that low ground. Yes, that low place extends off toward the river—in that direction. This particular low place,
7594 I think, turns toward Dry creek. I don't think this draw crosses the ridge. You know this divide forms a ridge here, and I don't think the low ground crosses that ridge now. Yes, it runs up to the road up at its upper end so that there is just a narrow ridge between it and the river. I should think this little ridge up

at the upper end of this draw is about four to six feet high, and the width of it between the river and the head of the draw is a mile. After it runs out here about a mile and a half it gradually runs out to Dry creek. Yes, sir, we call that Dry creek because it don't have any water in it except in cases of high water. No, sir, it has no water in it now. Yes, sir, it drains some of the upland coun-
7595 try out there in times of rain. Yes, you can get water by digging in Dry creek. It is a kind of divide between the river bed and the other land north of it. North of Dry creek it is lots deeper to water than it is to the south.

As to whether the shortening of the bridge and the running of the approaches out into the old channel further helped to narrow the river, well, it did right at that point. It narrowed it about 400 feet. As to whether that had anything to do with helping to form islands and changing the current above there, I would say, I wouldn't think it had anything to do with the changing of the current any distance above; and then there are islands formed below about a mile that I don't think it would have any effect on. No, sir, there was no bridge across the river when we ran the ferry. As to whether if there was no bridge across there today there would be some use for a ferry the same as there was then, I would say, no, a person couldn't run a ferry across there now to amount to anything. It is only just little narrow strips. Then it was clear across, without any islands
7596 or anything. But I guess you could find places along there where the islands would not interfere. Yes, sir, the water has been running for a month now. No, sir, we have had no heavy rains within the last month or six weeks around here that I know of. I don't think they have had any close here. They have had, I suppose, in Colorado and up in there. I don't remember any heavy rains up about Dodge City and in that country.

Redirect examination.

By Mr. ASHBAUGH:

No, sir, the water in my cellar has not been influenced by any local rains here lately, and the water in my cellar today does not come from any local rains here. It is north and on the farther side of the ridge which is between me and the river, yes, sir. Yes,
7597 sir, the ridge is some four or six feet high, somewhere along there, and that ridge runs right through the central part of Great Bend, somewhat east and west, and the building we are now in cornering on the court house square is right on that ridge. It is on the highest part of it. Yes, sir, I say my cellar responds to the condition of the river, although the cellar is on the north side of the ridge.

7598 JOHN H. RUPERT, Great Bend, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Great Bend, in the southeast part of the city, about four or five blocks from the river, and I have lived in Great Bend thirty-one or thirty-two years. I came here in 1872. I garden some and farm some. After I came to Great Bend I worked around, buffalo hunting some, and broke sod and farmed and anything I could get to do. Yes, sir, I assisted Mr. Miller who just left the stand in operating a ferry here across the Arkansas river. Yes, sir, I have been familiar with the Arkansas river ever since 1872.

As to the average flow of the Arkansas river, exclusive of floods, for the last ten or fifteen years prior to the last year, as to how it compares with the average flow of the river during the earlier
7599 years, exclusive of floods (objection), I will say, why, there used to be water in the river most all the time, and since that time there hasn't been so much, only in floods. Yes, sir, I have noticed changes in the river during these years. It has been filling up and washing out. It fills up along in the spring and winter when there are no floods. It blows in and blows out. Yes, sir, I have noticed sandbars and islands in the river lately. Yes, sir, there are more sandbars and islands and they are larger than they were in the earlier years. To what extent that is true, I will say, considerably. That condition exists up and down the
7600 river four or five miles above and below. I haven't been much farther than below. Yes, sir, the sandbars and islands have grown up to trees considerably within the last ten or fifteen years. Yes, sir, there is an island down here in the river. It is not exactly under the bridge; it is right west of the bridge somewhat. Yes, sir, it runs down to the bridge. Yes, sir, I think that during the recent high water that island is washing out some. Yes, sir, I have wells on my place. No open well now, but I did have an open well. As to whether you would notice the water in an open well in the bottom lands rise and fall according to the condition of the river (objection), I will say, shallow wells would show that, yes, sir. As to how far back from the river I ever noticed that that took place it is on condition of the lay of the land, and I noticed that that took place back probably a quarter of a mile or a little more. Yes,
7601 sir, I have noticed it back a quarter of a mile there on my place. That is pretty nearly a quarter of a mile. As to whether the water in those wells rises and falls according to the condition of the river regardless of any rain (objection), I will answer, yes, sir, it doesn't make any difference about the rain.

Cross-examination.

By Mr. DAWSON:

As to my business, I have been gardening—working in a garden—as a business.

Yes, sir, I call this high water that has been coming for a month or two a flood. As to whether anything that is a good stream of water out here is a flood according to my idea, I would say, when there comes a surplus of water. No, I don't mean by that
7602 more than we need, but more than usual, yes, sir. As to what used to be the usual stream if this is a flood, I will say, if there was not a flood there was a good average amount of water in the river. As to what I mean by a good average amount, I don't know exactly how wide it would be. It would average probably a foot deep and in some places probably four feet and in some places not so deep across the river. I would call that an average flood. It used to be. It is not that way now. I guess as the river used to be that would be about five or six hundred feet wide, maybe. As to whether it has been narrowed up by carrying the approaches of the bridge out a good deal, I would say, yes, it is narrower than it used to be. Yes, sir, if there were no bridge there now a ferry would be a pretty good thing to use in some places if you wanted to cross. No, sir, the river is not in good condition to ford and has not been for a month or two now.

7603 I have five acres of land down by the river and I raise garden truck and a little feed and a little grass. I think I got that piece of land in 1886, and sometimes I have to go a foot for water on that ground, in some places, and in some places four or five or six feet. Today you could dig to it with your hand. No, the water is not about at the same place now as when I bought it. It is pretty close to the surface now. It is some nearer to the river now, probably a hundred yards, than when I bought it. As to the depth, I would go to a less depth; that is, when the river is up now. If the river were down and was dry, I suppose I would have
7604 to go about two and a half feet to water. Yes, sir, that is close enough in some places on it.

I don't recollect when I first talked with anybody about this case, I have talked a good deal about it—many a time. I don't know as I have talk with any of the attorneys about it. I first talked with counsel for Kansas just a few minutes ago, and as to whether he hunted me up or I hunted him up, I would say he hunted me up. No, sir, he didn't come to see me last year. Yes, sir, I was here. Yes, sir, easy to find, right here. Yes, sir, and I knew the same things about the river then that I know now.

I think my land runs somewhere near about a quarter of a mile from the river. Yes, there are some low places or kind of sloughs through it. Down at the river there is, but I have a lot up
7605 here—well this place is pretty nearly a quarter of a mile, somewhere near that, up here in town.

I think the river was dry in 1879. It seems to me it was. I don't recollect in the summer and fall of 1879 and over into the year 1880 whether the Arkansas river at this place was practically dry for several months. I was not in the Bend then; I was out in the country, and I don't recollect how it was. I think it was dry in 1874. Yes, sir, it was dry then. There was some water in it. Yes, sir, the first ten years I knew the river was from 1872 to 1882, and the last ten years would be from 1895 to 1905, and I think it was dry or pretty nearly dry in 1874, and it was dry or very nearly so in 1879. I think
7606 it was pretty nearly dry a part of 1880. I was not here in the Bend then. I don't recollect that we had a flood in 1877. I was not here at the Bend then. I was out in the country living on a farm. Yes, sir, I guess I was on the river half of the time during the ten years from 1872 to 1882, and as to whether I think it is a rather broad statement for me to say that the average flow was greater than in the last ten years when I was not on the river more than half the time, why, yes, there was more water in the river, generally; that is, the year round, then than now.

Q. But you say for half of those ten years you were not on the river. How do you know what it was when you were not here?

A. Well, before that I was—well, before ten years ago. No, I don't know how it was when I wasn't here.

Yes, sir, I said the first ten years I knew the river was from 1872 to 1882, and half of that time I thought I was on the river and the other half I was not. I think the average flow for that first ten years was greater than the average flow for the last ten years. I think so. As to how I know about the half of the time I was
7607 not there, I would say, I judge from the way things went. I look at the way the river ran, and the way the water ran, and the way it looked afterward, and the way it looked before. Of course I was not here all the time, and I have no special interest in the river whether it runs much or little, so that it don't overflow, no, sir. I don't pay much attention to it.

7608 T. B. UNRUH, Great Bend, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live five miles southwest of Great Bend. We have lived most a lifetime there since we have moved up there from the old country. That was in 1875. I came from south Russia, and I have lived in that neighborhood ever since 1875, and my business is farming. I have twenty acres shorter than a section of land. Yes, sir, that gives me 620 acres. I live a quarter of a mile north of the river. All of my land is on the north side except 80 acres, which is on the south side. The 80 acres adjoins the river, and I have been farming there since 1875.

7609 Yes, sir, I know the condition of the Arkansas river and have known it during the time I have lived there. I have known what kind of condition it was. As to how the flow of the river since 1890, exclusive of floods, compared with the flow of the river before 1890 (objection), I will say, well, before 1890 we had still water right along in the river, and since 1890 the river got dry. As to what effect it had upon my lands for the river to go dry, I will answer, as soon as we didn't get the underflood, that spoils the corn. That is, when the river is dry. As to how the underflow affected my crops in the early years, well, just because it is four or five feet to the water, and as soon as the river is full or half full that drawed from below, and if we had here and there a week or two or three weeks dry it would still keep it mulched from below. I mean mulched from the underflood, but not from the rain. I mean just like
7610 this: As soon as we had the river full of water or half full, that kept it right along mulched from below, and that helps draw the corn up. As to what kind of corn crops we raised in the early days (objection), oh, we raised a good crop of corn. As to what kind of crops we raised during a dry season, well, we didn't raise that much in dry seasons. Nobody could raise corn in a dry season without the underflood. And as to raising it with the underflow during a dry season when there was no rainfall, well, the underflood helped a good deal. During a season when there was no rain or but little rain it did assist in maturing our crops, yes, sir. (Objection.) As to how long that condition existed before the underflow went down, I will say, up to the year 1890, and since that
7611 time the underflood has gone down. Once in a while the river would come up pretty high, but it didn't last very long and the river went down and didn't amount to anything. As to how far back from the river the underflow influenced or affected my crops (objection), I will answer, oh, I couldn't tell how far it is. We live on the south side of the railroad track, about a mile and a quarter from the river, and it does influence my crops back this mile and a quarter, sure. I suppose it goes farther, but still the farther they go off the less they get. Don't you think so? Yes, I am sure that it does influence my crops a mile and a quarter. Yes, sir, I have noticed changes in the river outside of the underflow. I have noticed the banks changing, yes, sir. As to how they have changed, well, just on that account, the river gets dry, and
7612 once in a while when we had a big water spout or big rain or anything like that in the west the river came up and kind of filled up the river with islands. Yes, sir, the river channel has filled up with islands in these later years, sure. As to how many islands as near as I can tell there are between my place and Great Bend, I will answer, well, I guess just as many like in the Philippines. Yes, sir, the river bed is practically filled up with islands from Great Bend up to my places, and these islands are grown up with trees lately. As to when I noticed the trees beginning to grow on the islands in the channel of the river, I will answer, since it

began to dry. As long as the river was wet and had water the trees had no chance to grow.

Cross-examination.

By Mr. DAWSON:

7613 As to when the river commenced to drop when the underflow went down, I will say, it was in 1890; and as to what made it, I suppose the people must take out the water in the west. I have been up in Colorado in 1892, and I understood they irrigated a good deal there. As to when I understood they commenced to irrigate largely in Colorado, I will say, I don't understand it today and didn't understand it before, but I just heard that. Quite a number of years. No, sir, I don't suppose I did hear it again today. As to whether counsel for Kansas told me that it was the year about 1890 that the big ditches were taken out up there, I will say, I guess not. I believe he didn't tell me. And the reason I happen to fix on the year 1890 was, the river got pretty dry. In 1892 we
7614 had a good wheat crop. Well, I know something about 1895. The river was flowed over. Yes, sir, it did a whole lot of damage from Coolidge up to Dodge City, and it did a great deal of damage up in our neighborhood, about seven days. I lived on the river before 1879 and 1880 and I believe there was a good deal of water in the river in 1879 and 1880. As to whether I am as sure about that as the other things I have testified about, I will say, now, judge, look here. Likely you people put everything down, and just like this. I don't put everything down, and as to my remembrance of that time, I will say, I couldn't tell you anything about that year, no. As to how old I was when I moved up there, I will say, I got married in 1886, and I was then twenty-six years old, and I was about fourteen when I moved up there in 1875. I have lived up in that country ever since, yes, sir. My land is about three or four or five feet above the river, and if we make a well we go down
7615 twenty-four feet, but we find the first water about three or four feet and in some places five, where it is a little bit higher, and when the river is dry or low as to how far we go for water, I will say, we don't dig to that water. As to how I know the water is lower in the ground when it is lower in the river if we don't dig, I will say that anybody can see that if there is no water in the river it is deep to water. As to whether I can't see it if I don't dig, I will say, can't you see it in the river? As to how I know it is deeper in the ground then, I will say, it is a sure thing it is lower, yes, sir, because the river is lower—the water is lower. I have seen it.
7616 As to how I could see it if I didn't dig, I will say, anybody can see that if the river is dry and you go and dig you will have to dig maybe a foot before you reach water. Ain't that just the same on the ground? I think so. As to whether I ever dug any wells when it was dry, I would say, we got wells, we don't have

to dig any. No, we don't have any open wells where I could see whether the water was lower in the ground when the river was low. I have seen the water lower. Now, as to whether I think the water must be lower in the ground when the river goes down, I will say, I have seen it on my land, just because I have some land on the south side of the river, and last week I couldn't cross
7617 the river there on my place. There was too much water, and I have got to go around to the bridge. That makes me twenty-six miles round trip. And then it is pasture on the south side. On the north side where it runs off a mile and a quarter it is dry. On the south side it is very deep. The wagon cuts down six inches with a load of hay. That on the south side adjoins the river and the ground is all mixed up with sand and mud. As to how close to the river I drove when the wagon cut six inches, I suppose it is about a hundred steps. Yes, sir, the river had been out over the ground in some places, not all. As to whether it had been out over any of the part I drove over where the wagon sunk in, I will say, well, this land is a little bit rolling. I don't mean that the water will reach all this land.

7618 No, I have no open wells or holes on the south side of the river so that I could see the level of the water in the ground, nor on the north side. I have no holes and no open wells.

Yes, sir, I thought my corn crop got worse along after 1890 when the river got low. We got short on corn crops. As to whether I had a short crop when we didn't have sufficient rain, I will say, yes, sir, that is true. As to whether I have a good corn crop when we have the proper amount of rain rightly spread out through the seasons when we get good and seasonable rains, I will say, that is true too. It is my experience—I have lived there since 1875 and as soon as we got a whole neighborhood out there, up to 1890, and the
7619 river got dry, and it stays dry, and it didn't make any difference whether we had a good rain, an inch or an inch and a quarter or an inch and a half of water, but it seems to us it didn't help very much. It wouldn't last very long and it got dry. And just because, they kept on talking it was the dry river. That is my experience. Now, this year I have a good deal of wheat. The river came up some time along in April, I don't know what day it was, but before the middle, and I can't tell you—I have got wheat that high (indicating about five feet) just because of moisture from below, and if you go a mile and a quarter or a mile and a half or two miles farther north or farther south from the river you would not see that. We need good rains to make a corn crop the last part of June, July, and the first part of September, and to make a good wheat crop we need the rains or moisture in April. Yes, sir, in May the more rain the better it helps. But this year we didn't have any rain. No, I guess
7620 we didn't have a good rain in April of this year about the 24th. Maybe a little shower. But we had a good rain somewhere along in May, an inch and a half. As to how long we raise corn on some land without changing the crop, I will say we

still raised corn up to 1890. Well, in 1890 we didn't have any corn. We got mad and quit raising corn. As to whether we can grow corn fifteen years on land without wearing it out, I will say, well, if you change off, and if you don't change off,—well, we have got to do it. Yes, sir, sure we change off. We didn't change off up to 1890. As to whether the land was pretty well worn out in corn by that time, I don't know. Yes, sir, we had been growing it on there for fifteen years, and I suppose growing the same crop
7621 on there for fifteen years would wear the land out. Yes, sir, we are raising wheat now on that land. We make more money raising wheat than corn. As to whether it is better for wheat now than for corn, I believe it is for both good.

Redirect examination.

By Mr. ASHBAUGH:

Yes, sir, I have dug post holes on my land, and in digging post holes in some places we dug down so that we could strike the water. As to whether if we dug those post holes when the river was low we would notice that the water was nearer the surface in those post holes when the river was up (objection), I will answer, anybody can see that if the river is low down, dry, the water will go down, and as to whether I ever noticed that in those post holes, I will answer, you bet your life I did. No, sir, we didn't change the corn
7622 crop from one piece of land to another before 1890 and we put the same field in corn right along just on account of that kind of years we didn't have much land. I can explain another thing. (Objection.) Now, my information and experience is, about this river, if the people keep up the water in the river and once in a while we get a big rain or snow they go and tear up the headgates and let the water go, and for that matter the whole river will grow up with trees and any kind like that, and it is going to be danger later on from an overflow. Yes, sir, and from floods, just like you see it is in the east. That is my experience already.

7623 J. F. LEWIS, Great Bend, Kansas.

Direct examination.

By Mr. ASHBAUGH:

Yes, sir, I am the John F. Lewis called as a witness in this case on behalf of the State of Colorado some time since. Yes, I am familiar with the lands south of Great Bend, and especially in the region of the Rattlesnake, and to that extent that I would become familiar with lands that I have in charge there as a real estate agent passing back and forth to St. John, and different points along the stream, that is about all; and then I had some lands up there at the Salt Marsh, and I followed those lands from the Rattlesnake down to the Salt Marsh clear along the Rattlesnake. As to where the

Rattlesnake takes its rise, well, I don't know as I could tell just where it does rise. I have forgotten. I did know. I haven't had any land in charge over there now for three or four years. I haven't been over there very much and it has passed out of my mind.
7624 But it takes its rise not very far from the Arkansas river, in Ford or Edwards county. I think it is in Ford county, but I wouldn't be sure. As to which side of the Rattlesnake there are springs, I would say well, the springs from a point south of Lincoln township for twelve miles west as far as I have observed are all on the north side. They are on the north side of the Rattlesnake. In fact I never saw any that were not. But I am not familiar with the Rattlesnake west of Lincoln township, Stafford county, and in that region all the springs were on the north side and west side, yes, sir. As to how I account for that (objection), I account for that that the Rattlesnake is made up from the seepage waters of the Aarkansas river—from the underflow. As to what evidence I have of that, well, because it rises without regard to the rainfall, with the
7625 rise and fall of the Arkansas river. Yes, sir, it does do that. As to how far back that is from the Arkansas river, well, the Rattlesnake is about twenty-five miles south of here where I am most familiar with it. As to how near it is to the river across from Larned or Garfield, I couldn't state definitely about that. I don't recollect. I have a general impression that the Rattlesnake runs almost parallel with the Arkansas river until pretty near its source. Yes, sir, the general course of it is parallel with the general course of the Arkansas river, and as to whether it is from five to twenty-five miles distant, I will say, well, I don't know, unless it is right at its fountain head. At its source I don't know that it comes that close to it. I have forgotten. Twenty-five miles, I think, is its greatest distance. Yes, sir, its distance would lie between five and twenty-five miles from the Arkansas river. As to the lay of the country between the Arkansas river from the source of the Rattlesnake and the Rattlesnake river, well, it is quite a level prairie country, rather
7626 a wide valley, and sand hills distributed here and there to the south of it, yes, sir. There are sand hills parallel with the river all the way from immediately south of Dundee clear into Ford county that come close up to the river, and in some places they extend out four or five miles. At Larned they extend five or six miles. As to whether I have noticed the same fact about springs on other streams, I will say, well, I don't know as I had my attention drawn to it particularly. I don't think I would have noticed it in the case of the Rattlesnake if it hadn't been for the Crane family calling my attention to it back in 1890, and I investigated it then from that. As to whether those springs follow the condition of the Arkansas river and flow stronger when that river is up (objection), I will say yes, sir, they unquestionably flow stronger when the Arkansas river is up and they flow weaker when the Arkansas river is down.

Cross-examination:

By Mr. DAWSON:

7627 Yes, sir, there is a chain of hills lying between the Arkansas river and the Rattlesnake. It don't extend the entire way, but it does most of the way, exepting, I suppose, between sections 7 down here and 3, in this Liberty township. That is the only breach in that chain of hills that I know of. Yes, sir, I think there is some rise in the ground between the two streams. As to how the level of the ground water on this divide or chain of hills through there compares with the level of the ground water in either the Rattlesnake or the Arkansas river, I would say, my impression is that the water is on the same level with the river all the way through. Yes, I have investigated it in wells, that is all.

7628 As to whether I know as a matter of fact that levels run across between these two streams show that the level of the surface ground water rises as you go away from the Arkansas river in general conformity with the rise of the ground and falls as you approach the Rattlesnake, I will say, no, I think the rise is in the Rattlesnake and the river. The principal rise along the river is close to the river. It is within a few miles quite generally all along the Arkansas river. The rise is near the river then, and then after you pass back of that it is more gradual. It slopes again off toward the Rattlesnake. As to the general fall of the country in the neighborhood of the Arkansas river and the Rattlesnake being from the north and west to the south and east, I will say, I am a little undecided about this fall business. I have been deceived four or five times myself about the topography of this country. I used to think I knew, but I have come to the conclusion—— My impression is that the fall is to the southeast. As to whether it is true that the Great Plains from the Rock mountains down at least to this county falls generally eastward with some tendency in that locality to fall to the south and east, well, that rule is not very regular. These valleys south of the Arkansas seem to have a general run east and west parallel with the Arkansas river. I think the fall of the whole plains country as distinguished

7629 from little local break-ups is to the east or slightly to the southeast from the northwest. I think it is, from Dodge City east. I am not familiar with it from Pueblo, Colorado, down. Yes, sir, as a matter of geography I think it is generally east. The slope is to the east and southeast. That is my impression. Yes, sir, these springs I speak of come into the Rattlesnake from the northwest side. They come from the north side. Yes, sir, I presume whether there was any Arkansas river there or not, if there was any drainage, any springs breaking out of the country, I would expect them to break out in that locality on the northwest or up hill side. That would be natural, yes, sir.

Redirect examination.

By Mr. ASHBAUGH:

If there were no Arkansas river there, then as to whether those springs would vary according to the river, whether it is full or dry (objection), I would answer, no, sir, I don't think so.

Recross-examination.

By Mr. DAWSON:

7630 I believe I have heard the Rattlesnake sometimes called the Medicine. It is the stream that is four or five miles this side of St. John. Well, two miles. I guess that is right. That is the stream. A living stream of water all the time. No, sir, I never saw the Rattlesnake dry. I have seen the Arkansas river dry, yes, sir. I think I have seen the Arkansas river dry when there was water in the Rattlesnake. I wouldn't be positive about that, though, because I have not seen the Rattlesnake regularly every year.

STERLING, KANSAS, June 7, 1905.

7631 J. B. KEELEY, Sterling, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live two and a half miles southwest of Sterling, Rice county, Kansas, on the north side of the Arkansas river and between the river and the Santa Fe tracks. I have lived there since 1877, excepting two years I was away, or not two years, in that time.

7632 Yes, sir, I own 240 acres of land now, and then I have owned more land close by, 400 acres in all. Yes, sir, I am farming this land. It is practically all bottom land. There is one 80 acres that is four or five feet, perhaps, above the other. The 240 acres adjoins the river, coming up to the river bank, and I have owned that since 1877. I believe I have become acquainted with the Arkansas river and with the lands along the river in Rice county.

As to how the flow of the Arkansas river prior to the present high water, for the last ten years, exclusive of floods, would compare with the flow of the river, exclusive of floods, for ten or twelve

7633 years prior to 1890 (objection), well, now, of course I would have to use my judgment. From what I have observed in the last nine or ten years, I would say the flow would be fifty per cent. less than it was in the other five years. Yes, sir, I have noticed changes in the bed of the river. In order to describe those I would have to go back to what it was originally. When I first came here the river was practically devoid of trees and fully half a mile wide in places, practically, most every where, and what I would call about half a mile wide, and now it is filled up with cottonwoods and isl-

ands until the main channel or the channel that would come next to my place is not half as wide. I don't know how many feet. Yes, sir, there are cottonwood trees growing on the islands. They have been growing very rapidly this last five or six years. They have been growing there practically for ten or twelve years, some of them. As to how these islands grow, well, they grow from the sandbars forming above the water until the cottonwood seed would get a start, and then we have a flood, and high water and the debris and stuff would gather in there and lodge there and increase their
7634 size in that way. As to why the cottonwood seed did not lodge on the sandbars during the earlier years, well, there were practically no sandbars there, or not many, and there was no resting place for them—no place for them to stop. The river would keep up all the way through—we always had our June rise—that is, we supposed the mountain water came down. June and July and up into August sometimes the river would be practically full of water, and that is the reason I attribute that there was no place for the seed to lodge there and there were no trees there. As to whether there was cottonwood seed along through this country so that it could have lodged there if there had been a place for it to lodge, I will answer, there was cottonwood seed in the country but practically nothing along the river at that time.

As to the carrying capacity of the river at the present time to carry off flood waters as compared with the early days, the water being at the same height as measured from a point on the banks, well, there isn't near the capacity to carry water. I would think there wasn't more than half the capacity to carry surplus water than there was in the early days. If the amount of water should
7635 now come down the river that did come down in the early days, as to what effect it would have on the lands along my place, well, practically all along my place it perhaps wouldn't affect me a great deal on account that I have a very high bank at my place, ten or twelve feet high in some places; that is, on *myst on* my place. It overflows, and has overflowed in other places where it hasn't got this natural protection. But the same volume of water would overflow very much more land now than in the early days, yes, sir, it would (objection), for the reason I have given.

Yes, I know what is generally understood as the underflow. It is about six or eight feet to water on my land—six, perhaps. As to the level of the underflow changing since I have been there, I will say, I think it has, for the reason that when I first came here we had to lengthen our pipes to get water and in the cellars and wells we have to go deeper for water now than we did at that
7636 time. This change has taken place in the last ten years. The water has receded or appears to be receding and we have to go farther for it. Yes, sir, the underflow is considerably lower. As to how far back that condition extends (objection), now, I don't know any farther than my place, but I know that for half a mile on my place it is in that condition. I am positive. I am positive

as to that fact by digging down and finding the same water and the same level. I suppose I have put down twenty wells. Half a dozen of them have been open to the underflow. Yes, we
7637 could arrive at the same fact from a drive well. I dug all of my wells to first water and then drove from there down. Since about 1890, in order to find the first water we have had to dig down farther as much as two or three feet. That is true wherever I dig, and I have dug as much as half a mile back from the river. Yes, sir, that is true half a mile back. If we dug one of those open wells when the river is low, as to what we could notice in that well if the river should rise and remain up for some days or weeks, the water would rise considerably in that open well, and that is regardless of
7638 local rains in this country. As to the cause of that water rising in those wells (objection), well, now, of course I attribute it to the rise in the river. They don't occur when we have no rise in the river and they do occur when we do have a rise in the river, invariably, yes, sir. If a witness for the State of Colorado has testified that the presence of the water in the river does not have an influence on the underflow back farther than 500 or 1,000 feet (objection), I will say the distance would be greater than that from what demonstration I have had. It would be half a mile.

7639 As to what crops I have raised, we have raised all kinds of crops—corn, wheat, potatoes and alfalfa. They are our principal crops. To a certain extent I have been compelled to abandon the raising of any particular crop. To explain that, I will say that when I first came to Kansas I practically raised corn only. I didn't raise anything else but corn and was very successful with it for a number of years until the last eight or ten years particularly when corn ceased to be as productive and I abandoned corn to a great extent and substituted wheat for corn. As to why corn is less productive now than in the early years, I attribute it to the receding of the water or the sub-irrigation as we call it. In the early years the river would be up in June and July, and by that process the ground was kept moist and the corn would grow and mature. In later years, along through July and August, the corn would practically quit growing. It would make short crops. Yes, sir, I think that with the same amount of rain and with the land in the same condition we could raise better crops in the early years than in the later years. The difference is in the condition of the soil—the distance from the water. There seems now to be a lack of moisture. Yes, sir,
7640 there certainly was more moisture in the soil for the maturing of our crops in the early days from the underflow than in the later days. (Objection.) That is practically the only reason our corn was not as good in later years as it was in the earlier years. As to how far back that condition extends from the river, to the best of my knowledge it extends out quite a ways from the river. I don't know how far. I haven't observed it a great deal on my place. As to the lay of the land north of me

and as far as to Cow Creek valley, well, the land in my
7641 judgment is practically level. There are some little rises or sand ridges through the country, but I would say from the river to Cow creek—well, I can't say either—but my judgment is that Cow creek is as low as the Arkansas river or lower, and the land between them practically level. (Objection.) In between Cow creek and the Arkansas river (objection) there are places where the land is higher, that is, the level is a little higher on top than it would be in other places, but in my judgment there would be nothing that would stop the underflow. No, there are no rocky formations on the surface, and not in Rice county that I ever heard of. (Objection.) I don't know of any. I should have known of
7642 them if they had existed. Straight north from my place it is about eight miles to Cow creek. I never knew Cow creek to be dry in the early days. In later years, well, I am not sure that I ever saw Cow creek dry. Perhaps it might have been dry but I have never seen it dry. I am not able to answer the question as to whether in the early years there was more water in Cow creek than in later years.

7643 If practically all the flow of the water of the Arkansas river outside of flood seasons was taken and diverted in the State of Colorado for irrigation purposes, as to what effect it would have upon the flow of the river past my place (objection), why, there wouldn't be as much water coming down the river. There would be a lack of moisture.

Cross-examination.

By Mr. DAWSON:

7644 No, sir, I am not engaged in any other business than farming. I am not doing anything else. No, sir, I have never been engaged in any other business. I have been county commissioner of Rice county at one time. No, sir, through my political connections in the past I have not become acquainted with counsel for Kansas, and never knew either of them. I never talked about my knowledge of the river in this case to any counsel for Kansas until today. I met one of them here just a few minutes before noon. No one called my attention to it or sent me to him. I was just introduced to him. Yes, it was intimated to me that I would be a witness, today, before I met him this morning. I found that out by a notice. I got a letter from counsel, but I had never met him.
7645 I don't know as he knew anything about what I knew about this case. No, sir, I don't know why he came to write me instead of somebody else. No, sir, I was not subpœnaed, only this notice. I never did take any interest in this Kansas-Colorado case before I got that letter. No, sir, I haven't been damaged or injured sufficiently over there so that I ever made any complaint about it to any of the Colorado people or to the Government authorities. I never
7646 started any legal proceedings or anything of that kind, no, sir. As to when I first knew that large irrigation works

were being constructed in Colorado and large tracts of land irrigated with water from the Arkansas river, I will say I never had any general information. I understood they were irrigating from the waters of the Arkansas river out there, but not being acquainted with the country I didn't know to what extent. I understood that through what I had read. I suppose since they commenced using it it has been ten or twelve years or along there. No, sir, counsel did not suggest to me this morning that it was about ten or twelve years ago when Colorado commenced to irrigate. I knew that before, by just simply reading the papers, of the irrigation in Colorado. No, sir, I was never up in Colorado. I have been as far west as Kinsley along the river. I have never been up to Dodge City or Garden City. As to whether I ever heard of the fact that long before Colorado commenced to irrigate at all the Arkansas river for many miles—some 100 or 150 miles—had been in the habit of going dry during the summer and fall and no water for many years running across that stretch except in flood times, I will say no, sir, I know nothing about the peculiarities of the river in that section myself between Kinsley and Colorado. As to whether

7647 it is a broad statement for me to make that the taking out of the water in Colorado makes the flow of the river less here when I don't know whether the water would get across that desert stretch even if no irrigation were done (objection), I will say I knew nothing about anything else only the river being open all the way through.

I was raised in Pennsylvania, and as far as my acquaintance with the rivers in Pennsylvania is concerned it is the universal rule that when a stream once starts it grows larger as it goes down, yes, sir, and if you take any water out of it at one place it would naturally make it less below. That is the kind of streams I have

7648 been acquainted with, yes, sir. If it should appear that the Arkansas river has the peculiar characteristics of the plains streams, that is, that it comes out of the mountains a considerable, flowing stream, which gradually grows less until it disappears as it goes out onto the arid plains, as to whether that might not make some difference in my notion as to whether the taking out of water above that break would affect the flow of the stream below the break (objection), I would say yes, sir, that certainly would be, if it started in large quantities and diminished as it came down and would get less as it came down this way. No, sir, I know nothing about that personally.

No, sir, I know nothing about what is called seepage or return waters that come back to a stream from irrigation, either. No, sir, I have no notion as to the percentage of water which comes back to a stream that you spread upon the lands adjacent to it in irrigation. No, sir, I have no notion as to the percentage of the water spread upon the ground for irrigation which evaporates from the ground.

7649 As to whether there has been any improvements in the rains in this country, either in amount or character, in late years over the earlier years, that is a hard question to answer. But I don't think there has, in either way, no. I don't know as I notice any difference. No, sir, I haven't kept any records of the rainfall. As to their being any channel on the other side of the river from my place, I will say very little; and taking all of the channels together, as to how they compare in width and depth with the river channel as I first knew it, I will say, as far as depth is concerned I don't think it is any deeper. It is practically the same. And
7650 the width is very much reduced. No, I don't know what effect it has upon the bed of a flowing stream to confine the channel or make or narrower, that is, in regard to its scouring out. (Objection.) Yes, sir, there has been some made land along the section of the river that I know in my locality, along the banks. Some little. No, sir, I have known of none of the citizens assisting nature by filling in little channels between the island and the mainland and thereby attaching the island to their land, nor I haven't done that, no, sir. Yes, sir, the bridges along the river in this locality have been shortened since they were first built or since I have first known them. They have been carrying the approaches out into the river farther, thereby narrowing the channel of the river. That is the way they have been doing—by shortening the bridges. They have shortened them from the ends and carried the bridge out farther into the river, yes, sir, and thereby avoided the building of so
7651 long a bridge. But as to how much any bridge has been shortened that way in Rice county or anywhere else, I don't know. I believe some of them approximately have been shortened as much as one-third. As to how long ago, I would say, inside of the last ten years, to the best of my judgment.

As to when the first settlement began here and when the first settlers commenced to plant trees in any large quantities so as to start the timber that now appears over the country, I would say, they were planting them when I came here. Yes, sir, in the '70's.
7652 Yes, it is true that the cottonwood is the tree that was largely planted in the first instance. Before these trees were planted by the settlers there were very few trees in this country anywhere. Yes, sir, that is, on the river, anywhere I knew it. There was a lack of trees. There were not many trees here. I don't know whether a cottonwood has to be planted ten or twelve years before it begins to furnish seed in any considerable quantity. Yes. I know it takes some years, from my observation. I know the larger the tree the more the seed. As to whether these growths along the river began to make this clearly apparent about the time the bulk of the cottonwoods planted throughout the county by the early settlers had reached the age where they furnished large quantities of seed which were carried on the wind and deposited on damp soil wherever it could be found, I will say, yes, sir, to a certain extent that is true. I couldn't tell you whether the cottonwood is a seed that will travel

for tens of miles upon the winds, and I don't know as it is a seed
that carries as far or farther than any other tree seed I know
7653 of. I don't know as I have ever seen a cottonwood seed. I
have seen it fly. My supposition was that the cotton contained seed. I never examined it. I don't know that is a matter of common knowledge all over the country, and I am not sure whether that is the seed or not.

Yes, sir, I am sure that the river has narrowed about one-half, in that neighborhood. No, sir, I never measured it by any instrument there in late or early years. That is just my observation. And it is my judgment that the average flow of the water in the river for the last ten years has been less than it was in some other ten-year period earlier. As to how the average rainfall last ten years compares with the average rainfall between 1877 and 1887, I have no
way of knowing by any estimate, but I don't see practically
7654 much difference in the rainfall. I don't believe I see any
difference in it one year with another. In one year we might have more rain than in another year. Yes, sir, and one year we might have more water in the river than another year. There has been a good bit of water coming down this year. I think there was more water this year than we had two years ago, but I am not positive whether there was more last year than two years ago. And when I get back of last year—well, I don't just remember the year before last. As to 1879, I believe I was not here in the winter of 1879, and as to how it was in 1880, whether I could walk across it at this place, as I said before, I was two years gone. In 1879 and
1880 I was not here all the time. I think I left in 1879 and
7655 came back in the spring of 1881. I don't remember how the
flow of the river was in 1884. In 1885 there was a great deal of water came down the river. As to whether the river was practically dry in 1888 and also very low in 1887, I will say, I never saw the river dry at any time. Never in my life. As to whether I ever saw a better average flow for a period of ten months than it has had the last ten months, I will say, I don't know.

Yes, sir, Crow creek is in the neighborhood of about eight miles away from the Arkansas river. Yes, sir, it is my notion that the river supplies water clear across this flat to Cow creek. No, sir, I never sank any wells across to see whether that is the fact or not. I base my opinion upon other wells that I have seen. As to what was in those wells that led me to think the Arkansas river was furnishing water to Cow creek, I will say, all the wells I ever saw sunk were about the same depth. They would strike water at the same depth. That is, of course there is a little rise between where you get to Cow creek;
there the wells would be a little deeper. Yes, sir, it is be-
7656 cause I found the water on practically the same level clear
across this country. That is what I think. No, sir, I never ran any levels through to see whether it was on a level or not. As to whether I know as a matter of fact that even if one goes back onto the uplands, on the plains, you will find a sheet of water all

under the broad plains of this country the same as you will on the bottom, I will say I don't know, no, sir. If it should appear that even upon the plains where they run back fifty or sixty or eighty miles from the river you find them all underlaid or practically underlaid with sheet water and that the level of that sheet water is higher than the river, as to whether I would suppose that that water up there came from the Arkansas river, I would say not if it was higher.

Yes, sir, I know a little stream called Peace creek. I have been over it, yes, sir. As to whether I have a notion that the Arkansas river furnishes it with water the same as it furnishes Cow creek, under my theory, I will say, I don't know as I stated that the river furnished Cow creek with its water. Yes, sir, it furnishes an underflow across
7657 between the two. Whether I think it does the same, I am not sure about that. Peace creek is about two or three miles from my place where it empties into the river. No, the country is not the same as between the river and Cow creek. It is a little different country, and whether from the wells sunk across there one would find the water to be at the same level, I would say I am not much acquainted over there. Living on this side of the river, I haven't much business over there. But the underflow certainly extends to part of Peace creek, because it empties into the Arkansas river. I don't know how much the divide is between Peace creek and the river. As to whether that would make any difference in my theory, I would say only by the formation. I don't know of any
7658 stone formation between Cow creek and the river. I think I did say to counsel for Kansas that there was nothing that could interfere with the flow of the water between the two, underneath the soil. I think there is some rock that comes to the surface up here in the neighborhood of Raymond, in Rice county. Yes, sir, it comes actually to the surface, where you can see it with the naked eye, coming along on the train, but I have no knowledge as to whether that rock formation extends down through the country between Cow creek and the river. I know that rock is under the soil their, but I don't know how deep.

7659 Yes, sir, I would say that my land is six or eight feet above the bottom of the river. No, sir, the river at its ordinary stages is never a deep river. It never changes much. In an ordinary flow across the river it would get up within—well, level with the bank in some places. You see the river is not all the same depth. As to how deep you would find the water in an ordinary flow, I don't know. I never measured it. I never forded it or drove across it when there was much water in it. Yes, sir, I have forded it when it was not running at flood. In some places it would be three feet deep, and in some places two feet deep, and in some places there was no water at all. Three feet would be very low for the maximum depth in ordinary times. I don't know how wide the stream is at my place. I just couldn't tell you. No, it is not a mile, nor half a mile. I don't think it is a quarter of a mile, hardly.

7660 Of course when I speak of the river I speak of as far I can see until it comes to an island. Yes, sir, there is a little channel on the other side of the island there.

We continued to raise corn for several years after 1877, and up to ten or twelve years ago that was my principal crop. I didn't raise any wheat to any amount. No, sir, during that time I didn't fertilize the soil right along. As to whether it is a fact that where corn grows upon the same ground for fifteen or twenty years it naturally wears the soil out and produces less corn than where it is new ground, I don't know as to that. Yes, sir, and yet I have been a farmer since 1877. Of course I didn't raise continuous corn on this land. Perhaps there was a year now and then I didn't raise corn. I commenced to raise oats. I don't remem-

7661 ber how the wheat did after I commenced raising it every year. As to which is more profitable, wheat or corn, I thought corn was the most profitable. It was. I don't know exactly whether there is any particular difference between the returns per acre in wheat and in corn. I don't know which goes the deeper in with its roots, wheat or corn. No, sir, it was not because wheat would strike deeper for this underflow that I speak of that I changed from corn to wheat. No, sir, I don't know as it was. Yes, sir, I have got some alfalfa. As to how it does, not as well as—well, yes, it does pretty well. As to what is the matter, whether the water comes too close to the surface or not close enough, I will say, I don't know. I don't know as a matter of fact whether alfalfa land with water from eight to fifteen feet from the surface is better for that crop than to have it within two or three feet. I don't know whether the land is more valuable in a good stand of alfalfa or planted

7662 to wheat or corn. As to how much good alfalfa land will bring with a good stand on it in my neighborhood, per acre, I will say I don't know of any being sold. As to how the lands in the Arkansas valley compare now in price with earlier times, I would say, it is worth more now than it was then. As to how Rice county is in which I live as to prosperity, being more or less so than it has ever been since I have known it, I will say, I don't know.

In speaking of the average flow of the river, excluding flood periods, for the last ten years, and comparing it with some of the earlier ten years, as to what ten years I compared it with, I will say the years prior to the last eight or ten years. Taking it without any exceptions, as to how I think the average flow of the river for the last ten years from this day, including high water, low water and medium water, compares with the average flow of the river from 1877 to 1887 in my locality, I will say I am not able to an-

7663 swer that question. As to how the average flow of the river for the last ten years up to today compares with the average flow of the river from 1885 to 1895, I think there was more came down from 1885 to 1895 than there did from 1895 to the present time. No, sir, I never kept any measurements. As to whether I have in mind now the dry years I spoke of in the '80's, I will say, I

was two years—1879 and 1880—away from here. No, sir, I cannot approximate the difference in the percentage of water between the last ten years and the ten years between 1885 and 1895. I cannot.

Redirect examination.

By Mr. ASHBAUGH:

We harvest wheat here about the first of July, and we harvest corn about the first of September. Then if the underflow has any effect upon either crop during the dry season it would be more beneficial to the corn crop.

Recross-examination.

By Mr. DAWSON:

7664 As to what I mean by a flood period, I will say, a flood period would be when there would be an excessive and sudden rise in the river and then subsiding. Yes, sir, that is what I was excluding in answering counsel's question. I should rather think I would call the flow of the river as it has been for the last two or three weeks a flood period. As to how long this present flood period has lasted, I would say, well, living along the river, I have noticed it very particularly that today the river would be up two or three days and then it would be down. In a few days it would be up again, and down. I am not able to just answer
7665 your question as to whether this present flood period has lasted as long as six weeks. I can't say how long it has lasted. No, I cannot approximate it. I think it hasn't been as much as a month. I don't know as to three weeks. And I don't know as a matter of fact that there has been a large flood in the river approximating what it is today for at least six weeks last past, no, sir. I would say it hasn't been six weeks. No, I don't want to fix any time that it has existed, because the flood period might be two or three days, and we might have another flood
7666 period in four or five days. If the river was up now I would call it a June rise. I don't know whether it is up today or not. No, I haven't seen it today. I didn't see it yesterday. I might have seen it the day before, and I might have seen it the day before that. It was not up so very high then. It was running a good stream. As to whether I would designate that as the June rise, I would say apparently it was something on that order.

7667 J. H. SMITH, Sterling, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live at Sterling, Kansas, and have lived here for thirty-two years, and am in the banking business. I own 260 acres of land in this county—bottom land. It is from half a mile to two miles on

the Arkansas river. I have owned land in Rice county for thirty years. I am selling and buying whenever I get a profit. In this and in Reno county I have owned several thousand acres of land all together. I am pretty well acquainted with the lands in Rice and Reno counties.

Right here at the city of Sterling it is two miles to the Arkansas river. Yes, sir, Sterling is on section 21, and the river is not
7668 quite two miles south of the south line of section 1. It just cuts off the edge of the south side of township 21. But it is right close to two miles distant, directly south. I think I am pretty well acquainted with the city of Sterling. I have been living here from the time it was platted out, pretty nearly, and I have done a good deal of business in the county. My bank is located on the corner of Broadway and Monroe, Broadway running north
7669 and south and Monroe east and west, on the northeast corner. It is a brick building. That building was built about twenty years ago. The First national bank built it. As to how deep we went for a foundation, well, I don't know. The cellar under this building has only four steps down, I think, to the basement floor. There is a barber shop there. As to why we didn't go deeper at the time we built this building, it was on account of the water. No, sir, we couldn't have gone deeper at that time without getting into the water. We tested the underflow there and let it stand and went down and let it stand to make a test of it for weeks before we put our foundation in and decided just how deep we could go.

As to the average flow of the Arkansas river for the past ten or twelve years, exclusive of floods and prior to this recent rise in the river, how it would compare with the average flow of the river during the same seasons of the year for an equal number of years when I knew it first (objection), I will answer, in its normal
7670 condition I would say there was from two-thirds to one-half of the flow of water now that there was thirty years ago. Yes, sir, I have noticed changes along the river banks. The river is not much more than half as wide as it was thirty years ago. This condition of the river extends as far as I have been up and down it. As to how far that is, I have crossed it at a number of places, but to ride up and down it, to notice it very closely from observation, it would be ten or twelve miles, I suppose, each way from here. As to what other changes I have noticed, well, I haven't noticed any. In
7671 fact, I haven't investigated for that. Yes, sir, there are islands forming along and accrued lands are continually creeping into the river bed, and an island will form, and by and by a channel on one side will close up and throw it all onto one side, and it narrows it down and narrows it down, and in that way it has been going on for the last twenty years, I think,—for eighteen or twenty years it has been doing most of the narrowing up. Yes, sir, there are trees on these islands. As to how long they have been growing, I keep no data of that. I would simply have to guess at it. I would think the trees commenced coming along the river banks there and on the

islands that were forming in the bed of the river about fifteen years ago, maybe more and maybe less. As to whether there was any cottonwood seed twenty-five years ago along through this country that could have grown on these islands if the islands had been in existence, I don't believe there was. There wasn't a switch as big as a riding switch when I came here closer than eight miles to the town, and that was on Cow creek. The islands have become apparent and the growth of the trees most apparent in the last ten
7672 or twelve years. As to why these islands have grown up within the last ten or twelve years (objection), well I am not a geologist. My opinion is that the reason they have grown is that we haven't had water enough to keep them washed out. As to what leads me to that statement, well, it is like anything else, they were not there before they were there, and before they were there was when we had all the flow of the water in the river. I suppose a great deal of the water has been taken out of the river where they have been irrigating. Another cause is that in those early days very little of our ground was under cultivation and lots of the water would flow into the river, you know, and build up the flow of the river, whereas now thousands of tons of that water goes into the soil, because the soil is under cultivation. The reason the islands have grown up is that there is nothing to wash them out of the way. That is my opinion now. Yes, sir, that is my idea based upon my observation. As to what effect a continuous flow in the river
7673 has had upon these islands for the last few weeks, why I crossed the river at two places Sunday, riding out to see some lands, and I noticed the river was—there is a freshet now and the water is pretty high, and it was beginning to cut its way through the islands in some places, and was cutting away on the mainland in places. In fact there was scarcely river bed enough to carry the water down. A continuous flow for a number of weeks has a tendency to wash out those sandbars and islands that have been forming within the last ten or twelve years, as a matter of course, the same as you would float a log down. And of course it does do that. It has sandbars, remember, and if there is a heavy flow it keeps them out of the way. It will knock them out in one place and build them up in another. Our bridges along here have been cut down nearly half their length in the last twelve or fifteen years. Not quite that—perhaps one-third. Our bridge south of the town here is not more than two-thirds as long as it was when it was built there. As to the original banks down there where the river used to run, at the bridge south
7674 of the town, yes, sir, I can see the marks of it plainly. As to where they are in reference to the banks of the river now, there are two marks left over there now where it dropped in at different times. The river bank on the north side is exactly where it was in the early days. The river bank has been pretty nearly all on the south side, right due south. I will have to guess at that; I will say that it is 200 to 300 feet narrower than it was thirty years

ago. It is not an island I am talking about; I am talking about the mainland—the accretions. I wouldn't think the islands could have formed when the river was high, as I said a while ago. They simply keep washed out at that time, certainly. The accretions have been forming right along in the last eighteen or twenty years. It has been narrowing down. I haven't watched it closely enough to say on what day it did it, but it is my information and it
7675 is the general opinion that it is done because the flow of the water is reduced, and as a matter of course the water that comes down don't need as large a bed as it did, and the water seeks the lowest point and the rest of it fills up. It gets drifted in and the soil will fill in and it finally cuts the river down. As to the carrying capacity of the river today compared with what it was the first years I knew it, the water being at the same height as measured from the banks, I should think it was about two-thirds of what it used to be, guessing at it. I haven't measured it at all. If the same amount of water should come down now that would come down at high stages in the early days, it would overflow the bottom lands, that would be all. It would spoil the crops, of course. There wouldn't be much danger of drowning anybody, because it wouldn't be deep enough. Yes, sir, it would be destructive. It would overflow. And that condition has been getting worse instead of
7676 better in the later days—the narrowing down of the stream. As to the tendency towards the destruction of property, well, sir, I haven't been watching that closely enough to give you a good idea of it, because I don't have any good land that is right down to the river, and because about two or three years ago at one of these floods—and we laid it to the narrowness of the stream—the river had to leave its banks up here three or four miles and go out into the country three-quarters of a mile, I guess, and came down through the country and ruined my alfalfa field for me. It pretty nearly washed Mr. Keeley away there. It came right up near his door, and I guess he is nearly a mile from the river. Yes, sir, that was Mr. J. B. Keeley who was just on the stand.

As to the effect the lowering of the water in the river has had upon the underflow (objection), the underflow is from two
7677 and a half to three feet lower than it was in the early days here—I would guess two and a half to three feet—and that condition has continued from twelve to fourteen years, somewhere along there, when it commenced to sink. There are several facts I have in mind that lead me to make that statement. In the first place, in the early days here whenever we would have high water down at the river, whether we had any rain here at all or not, if there was heavy rains above it would raise the water in the river and send the underflow out here to the city and fill pretty nearly every cellar in town. It don't do it any more. About twenty years ago, as I have stated to you, we dug the basement for our bank building and we went down and tapped the water and kept tab on that for probably three or four weeks before we would undertake to

allow our foundation to be built, locating the mark of the underflow. Now, about four or five weeks ago we put in a cess pool behind the bank and we went down there. While we were digging that we undertook—that was at a time when there was no high water, the river was at normal condition,—and we undertook to guess about or to measure up about the distance of the underflow as we found it then when we went down to it, and the way it was when we
7678 laid the foundation on the same lot, we figured it as being three feet lower than it was twenty years ago. Now, we didn't go to the trouble of taking levels, you know, and making absolute levels. If I had known I was going to be called here, before filling that up I would have done it, but we just guessed at it. That cess pool is within thirty feet of that original basement. That was two or three months ago and before this recent high water. As to how deep it is to the water all over the city of Sterling, well, that varies. Probably five or six feet or more than that. There are little ridges and knolls in the city that are fifteen feet, probably, above the country around it, but at the present time I should think the underflow of water, taking it on the general level of the land—the general level of the land I would suppose would strike that now at about seven feet. I couldn't tell you what proportion of the houses or buildings in this city have cellars. As to whether when the river is high these cellars have water in them or not, I will say they do not now, but they used to. That is, on the main street is what I am speaking of then. Yes,
7679 sir, I had buildings here on the main street in those days. We couldn't have a cellar. It would fill up every time we had high water. We had them dug down there. Of course in the winter season the water isn't so high, but in the summer season there would be standing water in the cellar half the year. Oh, not half the year, but whenever there was high water. And it didn't make any difference about the rains here. As to how far back this underflow extends or has a perceptible rise or fall according to the conditions of the river (objection), I never tested it farther back than the city of Sterling, and that is two miles. As to whether I say that the underflow does go back at least two miles from the river, I will answer, I don't say it, I know it. If a witness has testified
7680 that the underflow is confined to a space along the river of 500 or 1,000 feet, as to what I would say as to the fact of that distance (objection), I would answer, well, that is a critical question. But I would say that the man who testified to that didn't know what he was testifying about or didn't care what he was talking about. Of course there is no truth in such a statement as that with reference to where I am acquainted with the river.

7681 Yes, sir, there is a lake or pond between the city of Sterling and the river. It is what we call Silver lake. It is nothing but a slough. Why, the lake in the early days here would average probably two and a half to three feet in the deepest place. It was deep enough so that ice houses were erected along the bank

and ice was cut there and stored right along the bank of the lake. Gradually, as the underflow receded the lake went dry. Then they went to work and put scrapers and horses in there and scraped down until they found the water again, and that is pretty nearly all that is left of the lake now, except during real high waters. Take real high waters and the lake is probably a third as large as it used to be at the present time. It is about a third as large as it used to be. But when dry seasons come on where there used to be plenty of water there is no water at all. As to the lay of the land between the Arkansas river along here and Cow creek, there is a gradual rise from here to what we call the divide. There is a gradual rise from the Arkansas river to the top of the divide, then it slopes off the other way to the creek. I would think the height of the divide would probably be twenty-five or thirty feet above the river. As to the
7682 bed of Cow creek being lower than the Arkansas river at a corresponding point, I have no idea. I have never taken any level of it and have never known of any survey being made. I couldn't tell you. Now, this divide pretty nearly runs out as you get down toward Hutchinson. It runs from the northwest to a southeast direction. When you get to Nickerson it pretty nearly levels out to a flat plain down there. As to the soil along the highest part of this divide, I never went down through it. No, sir, there are no rocks in there at all. As to whether there is anything so far as I know to prevent the underflow from extending as far north as the bed of Cow creek, I will answer, no, of course not. All I know about that is from talking with other people. (Objection.)

Cross-examination.

By Mr. DAWSON:

7683 No, sir, I have never held any political offices. I was on the city directory here. Yes, sir, I said that the level of the water underneath the ground here in the town of Sterling is affected by the state of the Arkansas river. Yes, sir, it is. And in the last twenty years in my judgment the level of the surface of that ground water has dropped from two and a half to three feet. Well, I said two and a half feet anyway. So that today the level of the ground water is about two and a half feet farther from the surface than it was twenty years ago when we first built our bank, yes, sir. No, sir, the basement under our bank does not show any water in it at this time. No, sir, we have no sewer system in this town. As to whether there are any drains or anything of that kind running
7684 through the streets or alleys, I will say, there are open ditches, yes, sir, to run the surface water off. As to when our streets were graded up and our ditches dug so as to run the surface water off, well, we have been doing it for the last twenty-five years. As to when it became anything like complete or near its present perfection, approximately, well, the ditch that was cut to carry the water off—we had a kind of canal cut down along the side of the

railroad and from there down toward the river, letting the water off down there. That was built several years ago. That is the principal drainage we have got. That has been cut—well, I will have to guess at it. It is about fifteen years ago, or maybe a little more, and that is about two miles long I should say. It varies in depth owing to the ground we are going through, and the little rises. It will average probably four or five or six or seven feet deep
7685 in places. It is about fourteen or fifteen feet wide at the top. No, sir, it does not run along the lower side or the side of the town between the town and the river. It runs right along beside the Santa Fe railroad. We got permission to cut it right along by the side of the Santa Fe railroad, on the north side, and that runs clear off down to the east. You see the ground has a gradual slope from here to the east. I don't know just how far it does run out, but it runs out as far as I have ever been down along there, that is, to look at it. It runs through the town. It runs right along by the side of the Santa Fe railroad. Yes, sir, there is town on both sides of it; and there is another one cut above that goes under the railroad and drops into that little lake you spoke of. Yes, sir, there are small drains or ditches that conduct the surface water into these larger ones. This cess pool I spoke of we sank two or three months ago.

I have not see- the Arkansas river but once for the last ten months, and that was last Sunday. As to how it was last
7686 Sunday, yes, it was running a good flow. But as to my general knowledge as to whether it has been a good flow for the past four or five months, this spring, I would say I have known nothing about it only from talking with others. As to whether I have heard any complaints that the river was low and only a little water in it this spring, I will say, since the wet season set in there has been talk that there was a good deal of water in the river, and that talk has lasted for three weeks, I should think. No, sir, you were not correct in understanding me to say that when the river is high now it doesn't have this effect that it used to have of the water rising in the cellars. As to whether the water rises in the cellars when the river is up now, I will say, yes, sir, once in a while. There wouldn't be any underflow if the water didn't come up when
7687 it was high in the river. As to whether you understood me to say in answer to counsel that now when we have ordinarily high waters we don't have the water in the cellars as we used to have it, oh, no, I said in the normal condition of the stream now there is no water in the cellar while there used to be water in the cellars here almost in the normal condition. I don't know of any water in the cellars here now, and as to the river being high and having been high for three or four weeks past, I will say it is not high like it used to be. It is inside of its banks, and I have seen three-quarters of a mile out of its banks, and within the last two or three years too. Yes, sir, that part of the river that was out of its banks was overflow instead of underflow.

As to whether at any time in the last year I have known of the river showing in the cellars of this town, I would say, yes, sir. Well, that is, within four years. But I don't know anything about it this year. No, sir, I haven't any in any cellar that I know of or am interested in or in any basement. As to whether I think
7688 it possible that these drain ditches that we have constructed over the town to carry off this surface flow that formerly went into the ground has had anything to do with the water level, I would say, I don't think so. We have never had any more than two inches of rainfall, and when that goes into the soil it doesn't wet it very deep. I don't think it would. As I stated before, these rains in the early days when the ground was under cultivation—you take our creeks, they would rise in half the time they will now. As to whether it is true that there has been a very large part of the country adjacent to the Arkansas river and on the uplands lying back from it over here west along its course that have been settled and put under cultivation in the last twenty or twenty-five years, I would say I couldn't speak any further than I am acquainted, and as far as I am acquainted I should say twenty-five or thirty miles I should think it is pretty near all under cultivation now. No, sir, that was not true twenty-five or thirty years ago. As a matter of course, it is true that the run-off from any given rainfall is much less on cultivated ground than it is on sod ground. Much less. As to whether if the same condition I have spoken of as existing
7689 within twenty-five or thirty miles of the river, which I know of, exists from here to the Colorado line, that in itself would account for a considerable falling off in the flow of the river during the summer or rainy season, I would say, that wouldn't make any difference, but you keep it out of there and it would affect it. If it don't run in from the adjacent country but if you had cattle enough to drink it dry, that would be the same thing. But as to whether that sort of thing would affect it, I would say, as a matter of course it would. It makes no difference where the water comes from if it gets into the river it raises it and it don't make any difference where it goes to, if you take it out it goes down.

As to whether it is true that since a great deal of land adjacent to the river has been plowed up during the dry season when the winds are blowing, a great deal more dirt and material blows into the river and tends to fill it up and choke it up than when the land was covered with sod, I will say, I don't believe there is as much dirt filling in now as there was in those days, and still we couldn't hardly account for it, at dry times. When there is wet weather you will hardly ever have winds that blow anything, but when it is dry I don't think the dust is anywhere near as bad as it was thirty years ago.

7690 We commenced planting cottonwood trees in this town in 1874—thirty-one years ago. As to it being true that it takes a cottonwood ten or fifteen years before it gets to be of sufficient size to furnish much seed, I would have to guess at it. I never timed

one of them. I would say, though, from general observation, about ten years. That would be my guess at it—my idea about it. Yes, sir, nearly all the trees planted here in the early days were cottonwoods, and the cottonwood bears a seed that carries long distances on the wind. The bulk of the timber that is springing up along the river now is cottonwood, yes, sir. There are some willows. As to whether the lands with which I am familiar have been affected in value or productiveness, generally speaking, by the lowering of this ground water, I will say I have not farmed any and all
7691 I could say about that is from the effect on the agriculture of the county and the country surrounding here. It has been changed largely from corn to wheat. I think our lands are probably selling higher now than they ever were. As to the wheat crop, taking it in a general way, in this country in comparison with corn, in regard to its value, in the yield per acre, well, I don't know. I would say as an opinion that good wheat lands are not worth as much as good corn lands. I would rather have good corn land than wheat land. If I have good corn land I have good grass land, and land that will produce more than one crop. But as I tell you, I am not a farmer. Yes, sir, there has been a good deal of alfalfa put in in this country in the last ten or twelve years. It is a productive crop. I think alfalfa land well seeded is as valuable as wheat or corn land. As to how this locality along the Arkansas river is as to general prosperity now compared with any earlier time I have known it (objection), I would say, this is one of our most prosperous periods. I think I have seen it when it was probably a little better, because we were getting maybe a little better prices. Our
7692 crops have been—three years ago there was a fine crop. Two years ago there was a fairly good crop. Last year there was a fairly good crop of wheat. As to whether I have noticed that the crops are good or bad according to whether the river is high or low, or whether that has any general effect, well, as I said a while ago, I know nothing about that only what I gather from the farmers in talking with them. They have cut out raising corn, pretty nearly. Some of them have told me that our country was not the corn country it used to be, that along the river here, on account of the lowering of the underflow, the corn don't do so well, and they have resorted to wheat. Three years ago we had our bumper crop here, in 1901. I don't know whether it is true that the flow of the river through this county was less in 1901 than last year. I haven't observed it at all. No, sir, as a matter of fact I haven't paid very much attention to the flow of the
7693 river or its effect of the country. I try to keep pretty good tab on the crops and the prospects of the people I am dealing with, but I haven't been watching the river flow, and pretty nearly all I know about the narrowing of the steam is simply that I went and looked at it to find out. No, sir, so far as the responsibility of the people is concerned and their capacity to pay, I have not taken into consideration the fact, nor thought it necessary, that the river

was a little smaller or a little bigger from year to year. We have got the best people in the United States, and they have got good farms and plenty of money.

Yes, sir, my bank is a national bank. No, sir, we do not loan on real estate, but I loan on real estate myself and I loan on the farm lands in this county, yes, sir. In making those loans I have never taken into consideration the effect of the lowering of the underflow or the change in the river from year to year. I have paid no attention to the underflow at all. I simply look to the value of the farm.

Redirect examination.

By Mr. ASHBAUGH:

7694 As to the value of farms, even in the present condition, as being sufficient to extend a loan, I will say, yes, sir. I don't want to give them more than fifty per cent. of the value. As to the lands along the river through Rice county being as productive now as they have been for the last ten or fifteen yers, and as valuable, as if the underflow had remained the same as I knew it in the early years (objection), well, I have tried to answer that question three or four times. I have said I didn't know anything about it personally. All I know is what I get from the talk of the farmers, and I stated that they have cut out raising corn and gone to raising wheat on account of the underflow. That is all I know about it. Personally, I don't know a thing about it. I said I would rather we were able to raise a diversity of crops than be confined to one. We
7695 raise winter wheat almost exclusively here, yes, sir.

7696 H. SWARTZ, Sterling, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Sterling, and have lived here since 1878. I was here in the fall of 1877 for a couple of months. I used to live south of the town and east, a mile, on section 34, and I lived there about six or seven years and then I moved to Sterling. I have lived in Rice county since 1879, and always in the valley of the Arkansas river since that time. My business is farming. I have between
7697 1,300 and 1,400 acres, and nearly all of it is bottom land. I have been farming it myself. A good share of the land is now rented to tenants. I get crop rent.

Yes, sir, I have been familiar with the Arkansas river and the lands along it since 1879. As to the average flow of the Arkansas river during the last ten years prior to the late rise in the river and excluding floods as compared with the flow of the river for the same seasons during the early years (objection), I will say I think the river has been lower in the last ten years, possibly fifteen years, than

it was before. Yes, sir, there have been changes along the bed of the river. The river used to be wider than it is now, and
7698 now there is a good deal of growth, timber and made land, along the sides of the river, so that it has narrowed up the stream very nearly one-third, I should think. That would be my judgment, that is, up and down the river. Yes, sir, trees are growing on the islands where the river used to run, and also on the sides of the river. On both sides there are places where the river used to run, and there are at this time trees on both sides of the river right south of section 34. Yes, those trees are on the islands in the river. I think I began to notice those first probably along about fourteen or fifteen years ago. Not quite that long. Perhaps twelve or thirteen years ago. As to how the carrying capacity of the river to carry off flood waters would compare now with when I knew it first, the water being at the same height as measured from the banks, I will say, it can't carry it off. That is the reason I say we
7699 have these little overflows now. If the amount of water should now come down the river that in the early days would have filled it to the top of the banks, why, I think it would come clear up to Bull creek, half way or more to the town. That is my judgment.

Yes, sir, I remember Silver lake here. I couldn't say about that having any surface connection with the river. No, sir, there was no inlet from the river flowing down into that lake. I never knew any or saw any. I couldn't say how the water gets into it.

Yes, sir, I think I know what they mean by the underflow from what these other men have talked. Oh, yes, we have talked it for years. As to the underflow on the bottom lands being as
7700 near the surface for the last ten or twelve years as it used to be (objection), I will say I don't think it is. My cellar across the corner over here used to have water in it in periods and it hasn't had any in it now for years. Besides that, there is a place down on the farm probably eighty rods or more from the river that is a low place; we call it a draw. Along in 1888 or 1889 or 1890, along there, the boys used to catch fish in there. We would ride horses in there, and it would come quite a ways up on the horses' sides, and in later years that ground between it and the river, I have broken it up and am farming it, and only when the river is up high has that place any water in it at all any more. Now, that is all I can account for this lowering of the underflow. As to whether I mean that that water in the low place was higher when the water in the river was higher (objection), in the early days that always had water in it, because we caught fish out of it, but within the last twelve or fifteen years that land has been broken up on that low place and it is in grass now and there is hardly ever any water in it at all unless there is a rise in the river. If there should be a material rise in the river and it remained up for some days or weeks, as to what effect it would have, I would say, yes, four or five
7701 days, then it will rise. That is back from the river a little

over a quarter of a mile. I have never noticed Silver lake so much, as to the rise of the water in the river. As to the water in this pool that I spoke of rising from the river regardless of rains, I will say, if the river comes up here it will rise, but from rains, it hardly ever affects it at all. You would hardly ever notice it at all. You can't notice any water from the rains. Yes, sir, when the water does come up in that draw it is from the river. You would
7702 hardly notice it from rains. (Objection.) As to how far back the rise of the water in the river affects the level of the underflow, I will say I have seen it along the river there when probably the ground would be dry half a mile in places from the river and in three or four days' time you could go along there and you wouldn't see that the river was up and you would see in the wagon track or in a track along there that there had been moisture coming up in the tracks or the least little bit of a low place. You could see that the water was kind of rising and the soil was getting damp. Then as a rule you could tell that the river had been up. If I had been coming along there I would say "Well, the river must be up." "How do you know it?" "We can tell it here." I have had lots of men ride out with me. I go out to the farm every few days to look around, and there is nearly always some one wanting to go along, and I say sometimes "Why, the river is getting up, it is getting damp along here." And then after seeing that and we would go and look at the river, then I would always find a rise in the river. I wouldn't like to say how far back the river influences the level of the underflow. (Objection.) I have seen it
7703 and know it positively half a mile and three-quarters of a mile, because I have seen it in places. Yes, sir, I spoke of a cellar diagonally across from this building, and as to the rise of the river affecting the water in that cellar, I will say, I said that there was always water in this cellar in the early days. There always was, and every year, and that is of course a little over two miles from the river. No, sir, this rise of water in my cellar was not produced by rains.

Cross-examination.

By Mr. DAWSON:

I had water in my cellar I think it was last year. This last year was the last time I had water in it. Yes, sir, the water has been pretty high in the river for the last three or four weeks.
7704 No, sir, I had no water in my cellar. I saw the river last this morning. As to whether I had water in my cellar all the time in the early days or had it occasionally, I will say, more or less every year. That is what I meant by it. Sometimes it would stay for two or three weeks, and that was mostly in high water. As to how much difference there is on a point on the bank of the river opposite this town where the water in those times of highwater would strike it and where it strikes it now, I would answer, I don't think

there is really any difference on top of the bank, that I can see.
And if one should go down to the bank of the river today, it
7705 wouldn't take a stick any longer to reach from the top of the
bank down to the water than to the water I am speaking of in the earlier days that put water in my cellar. Yes, sir, I think it would be very nearly the same. As to how I account for it that there is no water in my cellar now although the river has been up three or four weeks, I couldn't say as to that.

This Bull creek lies between the town of Sterling and the Arkansas river. It is about a mile from the town and a mile and a half from the river. It seems to me that Bull creek bottom is lower than the ground between it and the river, and is lower than the ground this town is on, yes, sir. As to how much, I should think it would be, just guessing at it, six feet, probably more. Bull
creek starts in a little here at the west of the town, and ex-
7706 tends, I think, six or eight miles east. It runs right across
between the town and the river and keeps on for six or eight miles until it runs into the river, yes, sir. It has running water in it nearly all the time.

Yes, sir, I know about these drains they have built here about Sterling, and the ditches to carry off the water that falls on the ground. No, sir, we haven't had as much water in our cellars since they were built, or as much of the time, as we had before. I don't think we have had as much.

No, I haven't bought and sold a great deal of land at different times. A little, though. Yes, I have bought some. As to whether I would give any less for land or take any less for my land because the underflow has gone down as I would if it had not, I will say,
no. Land is higher than it has been. As to whether I
7707 would give and more for my land or would take any less for
it if I could bring the underflow up two feet higher than it is now, I would say I would give more for it if I was positive the river would run like it used to when we had water in it continually the year round. That is, this ground along the river. Now, about back or upland, I don't know anything about that, because my land is all along the river, and this is the only land I know anything about. As to whether I would give more for it if the water would be nearer the surface under the ground, or because it wouldn't overflow so easily on account of the river being narrowed up, I would say for two reasons—it wouldn't overflow so easily, and when the water is up we can raise better corn. I used to raise mostly corn; now I raise wheat, or aim to, and just a very little alfalfa. Yes, sir, I find alfalfa is a profitable crop, probably. It wouldn't be as profitable to me as corn. As to whether if one were selling the crops on the market the product of an acre of alfalfa
would be equal to the product of an acre of corn or wheat,
7708 I rather think it would, for an acre or probably two or three
acres, but right here at home I don't think it would be to have two or three or four or five hundred acres in alfalfa. A per-

son probably could find a market for it or feed it to stock, but yet at the same time there has been quite a little bit of alfalfa left over from last year. Those people couldn't find a market, and a good deal of it was damaged last year from the rains.

No, sir, I never knew the valley lands along the Arkansas river in this locality to be higher priced or more valuable on the market than they are now, and I never knew the general condition of this section of the State to be more prosperous than it is at the present time.

No, sir, I have never taken any particular interest in this suit between Kansas and Colorado. None at all. As to when I was first talked to in reference to this suit and in reference to being a witness, I would say, it must be something like two weeks ago, I should judge. Mr. Smith, the banker, asked me how long I had been here. He says "You have been here quite a while, haven't you?" And I says "Yes, sir." He says "What year did you come here?" I says "I came here in the fall of 1877." He was
7709 the first one who talked with me about it or ever spoke to me about it and the only one who spoke to me until this gentleman (counsel for Kansas) asked me if I was Mr. Swartz when I came in here and sat down today. No, sir, Mr. Smith is not my banker. I don't know anything about why he inquired of me about this matter. He didn't tell me that day that he wanted me to come as a witness, but a few days afterward he met me on the street and he said (objection)—he just asked me if I would appear as a witness. I told him I didn't care.

As to how long I have been familiar with the fact, by reading or general knowledge, that they had been using water from the Arkansas river for irrigation purposes in Colorado and were building large ditches up there, I would say, I think eight to twelve or thirteen years ago. No, sir, I never made any objection or complained or started any legal proceedings or anything in reference to stopping the folks there from irrigating, and so far as I am concerned I have paid no attention to what you were doing with the water in
7710 Colorado. As to whether I have gone far enough to even make up my mind in regard to it or care in reference to it, or take it into account in figuring on my lands or prices or anything of that kind that I would ask or give or take (objection), I don't think I have.

Redirect examination.

By Mr. ASHBAUGH:

Yes, sir, this is a broom corn country, and most of it used to be raised along the river. As to whether my lands would be more productive and more valuable if the underflow were now as it used to be, I would say why, I think it would. Yes, sir, it would be better broom corn land also as well as corn land.

Recross-examination.

By Mr. DAWSON:

7711 Yes, sir, I have known the river to have a better average flow in it for ten consecutive months than it has had the last ten years, since last August. I think in the early days it used to be higher or had more water in it than it did this winter, yet I might be mistaken. As to whether I have ever known it to have a better flow over a period as long as ten months, which would include last August and September and all the rest of the fall and winter and all of this spring and up to the present time, I would answer, I couldn't say as to that. Yes, sir, I think for all practical purposes the average flow of the last ten months is as good as the average flow for any consecutive ten months I ever knew it. I think so. If that be true, and the river affects the underflow, as I believe it does, as to why the level of the ground water or underflow should not be as good today as it was in the earlier days, and whether ten months is not long enough to raise the level up again, I would answer, why, I should think it ought to be. Well, yes, I think
7712 it is as good today as in the earlier days. To take it along the river there where I had spoken about that pool, I should think right there it would be just as good today as it was then, because I think if we could go there we would see water in there today just the same as we did then. As to whether it is as good here in Sterling under my house, as to that I can't say. The water is not in my cellar, and I am glad it is not in my cellar, yes, sir. (Objection.)

Redirect examination.

By Mr. ASHBAUGH:

As to whether the flow in the last ten months has been an even flow or has been excessive floods once in a while, I would say it has just been up and down. There hasn't been an even flow for ten months, not a continual, even flow, I don't think, and I have crossed it from one day to every day in the week for the last—— I
7713 should think that we had some excessive floods that would raise the total, but we didn't get as good an average. (Objection.) As to there being an even flow for the last ten months (objection,) why, the river has been up and down. If the excessive floods might make a high average if it should all be added together, then as to whether it has also made a high even flow (objec-
7714 tion), I will answer, why, I don't think it would have made such a high average. As to whether I ever knew the Arkansas river to run at the same stage and keep an even flow for ten months together, even in the early days, without going up and down, I don't think I ever saw it ten days.

7715 J. M. McGEE, Sterling, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Sterling, Kansas, and have lived here since March, 1879. Up to the last twelve or fourteen years I was frequently across the river and around it. I was in the implement business. As to how the average flow of the river outside of floods for the last ten or twelve years down to the recent rise of the water in the river compares with the flow of the river for the same seasons during
7716 the earlier years, I will say, these questions are pretty hard for me to answer. (Objection.) While I have frequently seen that river when I first came here, the first year I was here, in 1879 and 1880, it was pretty dry seasons and the river got pretty low, but then for several years after that I used to frequently cross the river there and there seemed to be plenty of water in the river most all of the season. In fact I have been caught on the other side of the river when I couldn't get back on this side. As to the last ten or twelve years, during several summers it has gotten very low and sometimes there was but very little water passing in it at the bridge down here. As to any changes along the river, I will say, there is lots more timber along the river than when I came here—more cottonwoods—and the river in places—the cottonwoods have crowded out until the channel is not nearly as wide as when I came here, in a great many places. As to how far up and down the river that exists, I have only been acquainted with it from
7717 about Nickerson to down here about Raymond, that I have been along the river. Raymond is twelve miles west and Nickerson is nine miles east. As to whether the river channel is as wide between Raymond and Nickerson as it used to be, I will say, I think not, in a good many places. As I said, a good deal of timber has grown in, and of course islands forming with timber on them. As to how extensive that is, I will say that is a question I couldn't answer. There are a great many islands, though, and they are covered with cottonwoods and on some of them there is grass. I don't know as I could tell when the cottonwoods began to grow on these islands exactly; in fact most all of the cottonwoods in this country have grown since I came here. There was only a few of them
7718 when I came. I wouldn't undertake to say how large those trees are on the islands. Sterling is about two miles back from the river—a little over that—about two and a half, to go straight down.

Yes, sir, I have noticed water in the cellars in the city of Sterling, and there is some of it in some of the cellars right now. When the river is high there is water in the cellars here (objection), and there is no water in the cellars here when the river is low and has

been low for some time. The cellars are then dry. There is
7719 a creek between Sterling and the Arkansas river called Bull creek. No, sir, there is not much of a stream there; it is just a small stream, a kind of slough, fed by springs or something like that.

HUTCHINSON, KANSAS, June 8–9, 1905.

7720 SAMUEL HIRST, Hutchinson, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in the city of Hutchinson, and have lived in Reno county since 1873, in March, thirty-two or thirty-three years continuously. We first settled about eight miles southwest, in the country.
7721 I lived there with my parents on that farm until 1881, when I moved to Hutchinson, and have lived in Hutchinson continuously ever since. I am a photographer.

Examining Complainant's Exhibit A–55, I will say, that is a view of the Arkansas river showing the iron bridge across the river at at this place. It was taken in the year 1887, or that is about the time. Yes, sir, it is a correct view of the bridge across the Arkansas river at Hutchinson, and so much of the river as is shown. As to whether that shows the river at high or low water, I will say, I usually made my negatives at high water times. (Objection.) I can say definitely that it was high water. That is the only
7722 time I make my negatives. I took that picture.

(Complainant's Exhibit A–55 offered in evidence. Objection.)

Examining Complainant's Exhibit A–56, I will say that is
7723 a view of the Arkansas river taken from the north side of the river showing the bridge at Hutchinson. I took that picture in the year 1900, and it is a correct view of the Arkansas river and the bridge at Hutchinson as it appeared in that year.

(Complainant's Exhibit A–56 offered in evidence. Objection.)

Exhibit A–56 was taken during high water. Exhibit A–55 was taken from the south side of the river and Exhibit A–56 from the north side.

7724 Examining Complainant's Exhibit A–57, I will say that is a view made from the Arkansas river bridge—the wagon bridge across the Arkansas river. It is a photograph showing the part of the river from the bridge that is shown in exhibits A–55 and A–56, looking down the river. The river runs in a southeasterly direction there. I took that photograph (Exhibit A–57) and
7725 it is a correct photograph of the river at the time it was taken, which was the 15th day of May, 1905.

(Complainant's Exhibit A–57 offered in evidence. Objection.)

Examining Complainant's Exhibit A–58, I will say it is a view of the Arkansas river taken from the Missouri Pacific Railroad bridge, which is about a mile down the river below the city of Hutch-
7726 inson, somewhat south and about a mile east. I took that photograph on the 15th day of May, 1905, and it is a correct photograph and view of the Arkansas river from the Missouri Pacific Railroad bridge about a mile southeast of Hutchinson, on the 15th day of May, 1905. The stage of the water at that time was high. The different pieces of land shown in the photograph, having trees on them, in the center of the river, are islands.

(Complainant's Exhibit A–58, offered in evidence. Objection.)

Examining Complainant's Exhibit A–59, I will state that
7727 is a view of the river, also taken from the Missouri Pacific Railroad bridge, taken a little farther over than Exhibit A–58, which was taken more in the center of the bridge. Exhibit A–59 is looking up the river from the Missouri Pacific bridge, and it is a correct view of the Arkansas river as it appeared on the date I made that photograph—on the 15th day of May, 1905. The stage of the water was high. That large space of ground with the large trees shown in the bottom and center of the picture is an island—islands. This is on the north bank of the river. The land with the trees on it that is shown just beyond the first strip of land all through the picture from left to right is a large island in the stream,
7728 and the light spot just beyond that large island is water in the Arkansas river, on beyond that island.

(Complainant's Exhibit A–59 offered in evidence. Objection.)

Yes, sir, I lived on a farm eight miles south of the city of Hutchinson from 1873 to 1881. At its nearest point it was seven and a half miles from the Arkansas river. The land was rather level. It was thirty-four feet to water. We had one open well—a windlass well. We drew our water with a windlass. Yes, sir, to a
7729 certain extent we could ascertain the depth of that water from the drawing of the water. Yes, sir, the water in that well was higher or lower at different times of the year. As to what determined the height of the level of the water in that well (objection), it was determined, as we considered, by the height of the water in the Arkansas river. (Objection.) As to how we came to that conclusion, whenever the river was low the water was low in that well, and whenever the Arkansas river was high we had more
7730 water in the well, and that was regardless of any rain. I don't exactly know the condition of the water level out in that country and how it has been for the last ten or twelve years. Since that of course they have put down point wells and it is a hard matter to determine the depth of the water. As to whether in later years the water in that well I spoke of was lower or whether it ever

went dry (objection), I will answer, it has never gone dry, and I don't know in regard to the depth of the water from the fact that it is a driven point well now. Yes, sir, we have changed it since those early days.

Cross-examination.

By Mr. DAWSON:

Complainant's Exhibit A–59 I think shows all the river. I don't think there is any of the river on the other side. Yes, sir, that is an island in front. It was what was a sandbar and it has grown up now. As to whether it is not an island unless there is water
7731 around it, I will say, it may be there is water on the other side, yes, sir. Yes, sir, the land on the left of the picture or beyond the strip of water is an island. Yes, sir, it shows the river on the other side of that island. That little white strip you can see through the timber—that is water. It shows as much water as could be shown on account of the islands. Yes, sir, there is a stream on the other side of that that appears, something like the stream that appears in the foreground of the picture. As to whether it is shown to any extent, I will say it is shown in the other view and this picture only shows the river as it exists from this point of view. Yes, from that point of view I got a picture which shows all of the river. It showed the river on both sides of the island, as much as could be
7732 shown. Yes, sir, there was a stream of water running on the other side of the land which appears in the left of the picture—running back of that. It shows the water running over here. As to the fact that it shows only a very slight glimmer of it through the trees and doesn't show it completely, I will say, it shows it as completely as it could be shown from the point of view from which the picture was made. As to whether I was in a position where I could show all of the river clearly in this particular view or whether it is a fact that there are other channels and streams running on the other side of these islands that do not clearly show or appear in the picture, I will answer, there is a stream running across on the other side of the island the same as this side here, and we couldn't get it in this view. It doesn't appear here, no, sir. There is
7733 another stream, yes, sir. I rather think there is another little stream running through there on the other side of the island, in the right hand corner, that don't appear.

Yes, sir, I lived seven miles southwest of Hutchinson on this farm. That is about four and a half miles this side of Partridge—in the neighborhood of that—and the Atchison, Topeka & Santa Fe railroad runs about a mile and three-quarters north of that place, that is, the road running between Hutchinson and Partridge.

Yes, sir, the reason that I thought the river affected the level of the water in our well is because when the river was high there was more water in the well and when it was low there was less water in

the well. I couldn't give any other reason. As to whether
7734 I know as a matter of fact that the level of the surface of the water in the ground at the point where our farm is located is approximately fifteen or twenty feet higher than the level of the water in the river, I will say, no, sir, I do not. No, sir, I don't know anything about whether it is or not. I never ran any level over it. In going through the soil to reach this water we had in the well we struck the first water at thirty-two feet. I guess this would be called upland where the well was and all through that section of the country. As to whether it was in the dry years when we had but little rain in this country that our well was low and in the years of ordinary rainfall or excessive rainfall that it was high, I will say, it was in the year 1879 that the well was the lowest. I don't remember whether that was a drouth year through this country or not.

Yes, sir, the year 1879 was the driest time. That was the
7735 time when the water was the lowest. But I don't remember whether that was a drouthy year or not in this part of Kansas. I don't remember how the crops were. At that time I was not very old, you must remember. I was born in 1864, and in 1873 I would be nine years old. As to my recollection of the farm being that of a boy between the ages of about nine and seventeen, I will say, yes, I was seventeen when I left home.

7736 FRANK VINCENT, Hutchinson, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Hutchinson, Kansas, and since the first of March, 1874, have lived continuously in Reno county. I have lived in Hutchinson twenty-five years. In the summer of 1874 I lived in Hutchinson, and from January 1st, 1875, to October, 1879, I lived in Castleton township, excepting one year I lived in Lincoln township.
7737 Since 1879 I have lived in Hutchinson. As to my business, I am the vice-president and general manager of the Hutchinson Salt Company and also conduct farming to a small extent. I have been connected with the salt business about eighteen years. Yes, sir, our salt business in Hutchinson is considered extensive, and I think it is the largest salt works west of either Michigan or New York. (Objection.) As manager of this salt business
7738 and in conducting my farming operations, I will state that I am familiar with a portion of the land of Reno county, and I think I am familiar with the Arkansas river or that portion flowing through this part of the county. I have held the position of mayor of Hutchinson and State senator for this district, which comprises Reno, Kingman and Pratt counties. I was State senator for four years, being elected in 1900.

Yes, sir, I introduced the joint resolution in the senate in 1901, in the Kansas legislature, authorizing the attorney general of the

State of Kansas to bring this present action. As to what
7739 changes I have noticed in the Arkansas river in the thirty-one years I have lived in the county, I think there is a much less volume of water flows down the Arkansas river than did in the earlier years. The Arkansas river has lately filled up with islands, and timber has grown there, and brush, and the river I should think was about one-third narrower here at the town than it was in the earlier days. I think there is not more than two-thirds of the water way that there was in the river bed in the earlier days. As to how far that condition of the narrowing and filling up of the river channel exists up and down the river from Hutchinson, I will say I only know by personal observation probably twenty miles, and I should say that it does exist twenty miles according to my personal observation, yes, sir. Yes, sir, my business, calls me around on the railroads a good deal. I cross the
Missouri Pacific bridge across the Arkansas just below the
7740 city of Hutchinson quite often. I cannot really describe that bridge. (Objection.) I cross that bridge mostly at night and have paid no particular attention to it. As to the appearance of the river from the wagon bridge in Hutchinson as far as you can see from the bridge both up and down the river (objection), I will say the river has the appearance of being filled up with islands covered with brush and bushes and grass. To the best of my recollection of that condition those islands have been formed there since about 1890, and they began to grow over with
trees and shrubbery during the past ten or twelve years. As
7741 to why those islands have grown up in the channel of the river for the last ten or twelve years (objection), I will answer, I take it because there is not sufficient water in the river to keep the obstructions washed out. As to the carrying capacity of the river today to carry off flood waters in comparison with its carrying capacity twenty-five years ago, the water being at the same height as measured from the banks (objection), I would answer, that of course would only be my judgment. I should say not more than half. If the same volume of water should now come down that in the early days filled the river bank full, as to what effect it would have on the bottom land through Reno county (objection), I will answer, the
water would seek its level by percolation or sub-irrigation—
7742 spreading out. If the same amount of water should come down now that just filled the banks in the early days, as to where it would go (objection), I will say that same volume of water that filled the banks in the earlier years, if it came down now at one time, it would simply overflow the river. It would have to.

I live in the east part of the city of Hutchinson, and it must be a mile and a half from the river. It is about eighteen feet to water at my residence. As to whether the condition of the water in the river has any effect upon the water level in my portion of the
city (objection), I will say we couldn't tell in our portion
7743 of the city. We are up on the highest land in the

city. As to what effect the different volumes of water in the river have upon the level of the water beneath any portion of the city of Hutchinson (objection), I will say the water rises and falls as the water rises and falls in the river. As to how far back from the river that condition extends (objection), I will answer, I only know back some five miles, of my personal knowledge, and it does produce that effect back five miles from the river, yes, sir.

Yes, sir, I am acquainted with Cow creek that flows through the city of Hutchinson. That stream enters the Arkansas river
7744 about five miles southeast of the city of Hutchinson, and the Arkansas river is about a mile south of the city of Hutchinson. At the center of the city of Hutchinson Cow creek, which flows right through the city, is probably a little south of the center of the city. As to whether the bed of Cow creek is lower or higher than the bed of the Arkansas river at corresponding points, I would say I couldn't testify to that. Levels have been recently made, but I don't remember if I have heard. Yes, sir, I remember in the early days of a canal that was dug from the Arkansas river for power purposes. (Objection.) That canal tapped the river about four miles west and north of the city and flowed into Cow creek in the western part of the city and then down through the south part of the city, where there is a large flour mill. That was the
7745 purpose of the race being put in. That canal was taken out of the Arkansas river and followed down the bed of Cow creek for a distance and then was taken out of Cow creek and was used for power purposes at this flouring mill.

Cross-examination.

By Mr. DAWSON:

Yes, sir, I introduced the resolution authorizing the bringing of this suit when I was in the senate. I don't remember whether I drew the bill or not. I don't recollect. I don't think Mr. F. Dumont Smith, one of the attorneys in this case, was in the senate at that time. There wasn't any attorney in the case that I knew of at that time. Yes, sir, Mr. Smith was in the senate then, but I feel very positive that I drew the resolution myself. Yes, I pushed it
7746 along and looked after it until it was passed. I did. As to whether I had the assistance of Senator Smith in that matter, I will say, to the best of my recollection I never talked with him about it nor he to me. I don't know that he assisted in any way in putting the resolution through, except I presume he voted for it, and I am not sure as to that. No, sir, I was not in the legislature at the last session when an appropriation was made for the prosecution of this suit.

I know of the flow of the river affecting this ground five miles back—that is, five miles north. As to how near that would be to the little town of Aiken, I don't know of such a town. That
7747 point would be northeast of the city of Hutchinson. At this

place I simply noticed it because I was figuring on buying a piece of land and I was looking to the sub-irrigation as we call it here and demonstrated to my own satisfaction that the sub-irrigation reached that far away. As to what were the manifestations which demonstrated that to my satisfaction, I will say, simply the rise of the water in the ground. That was through simply an opening or hole. Part of it I dug for that purpose. As to how long I waited until I got a rise in the river after I dug it, I would say, I was watching it probably for three or four months. I don't remember anything particularly now about the kind of opening, how large it was and what was the character of it. As I do remember it, it was some kind of an old well that had caved in from the top
7748 that we threw out. I don't remember the section and number, but I could probably find out at my office. I think this was in 1899 or 1900, I wouldn't be positive which. I don't remember particularly as to the flow of the river in that year, and I don't remember particularly as to the flow of the river in the year 1900. As to whether it was essential when I was digging this hole for the express purpose of seeing whether the rise and fall of the river affected it to know something about the stage of the river during the experiments, I would say I evidently did, yes, sir. As I remember now, we went about six and a half feet to the first water. Yes, sir, the water rose in this hole. As to how much it rose, that is awfully hard for me to remember. To the best of my recollection,
7749 though, it was some sixteen inches. As to whether I can designate on this map which you have handed me where I think this well would be, I would say, well, it is in here (indicating on map), more east than north, and as to my marking the place approximately where I think it would be, I would say I wouldn't like to do that for it would simply be guess work. I should think it was about half way between the Little Arkansas river and the Big Arkansas river, and in a northeasterly
7750 direction from Hutchinson. As to whether it is a fact that the ground at the place where I conducted these experiments is higher than the ground either at the Arkansas river or the Little Arkansas river, I would answer, I should think the surface of the ground is higher, yes, sir. As to whether it is true or not that five miles northeast of Hutchinson and at the point where I sank this well the level of the water in the ground, the surface level of it, is within three and a half to five feet higher than the level of the water in the river at the nearest point in a direct line, I would answer, I don't think so. No, sir, I never ran any levels on it to ascertain. I never did. And as to the reason I think so being simply because I have a notion that all the water in the ground is on a level with the water in the river, I would say, no, from the general lay of the country, riding over it and looking over it. As to whether the land there is more than five feet higher than the level of the water in the river itself, the surface of the ground, I doubt that very much. Yes, sir, we went six and a half feet to water at the dry time.

Yes, sir, it was a dry time. Six and a half feet is where we found the water at the low time, in 1899 or 1900, yes, sir. Which
7751 ever time it was, it was dry, yes, sir. As to whether that was near enough to the surface to satisfy my notion as to what constituted sub-irrigation, I would say, I was satisfied if the water came down the river it would raise it enough so that we would have plenty of sub-irrigation.

As to the narrowing up of the river here and as to the city or county or State or whichever one built this bridge carrying the road out into the river or narrowing the river there, I will say, well, the county has shortened the bridge. They carried the abutments back from the river channel, yes, sir. It hasn't narrowed the channel of the river at all. (Objection.) I think the bridge has been shortened about—well, I wouldn't be positive, but some four or five hundred feet. The approaches were made at the south end of
7752 the bridge before the bridge was shortened. It was simply filled in to the end of it, and my judgment is that there was no dirt built in there. Yes, sir, probably they drove over the sands that were deposited. Probably they would put some stone or something there. I suppose they did. What I mean is that they didn't put in deep filling or any filling or anything of that kind. No, sir, you don't have to fill very deep to fill as high as the banks of this river. I guess they are not more than three or four or five feet high as a rule. That is right. There has been no dumping done along the bank of the river or into what would be the channel
7753 when the river was up by the city or the people of the city that I know of. I couldn't tell you where the dump is around here where they haul off their stuff and deposit it. I have never been in that business.

As to the average flow of the river and as to whether I have been specially interested in the flow of it, that is, to the extent of having kept any memoranda or account or measurements of it, I would say I have kept no account at all and no measurements, but have been very much interested and have paid very close attention to it. As to how the flow of the last ten months on an average compares with any like period of time since I have known it, I would say, well, we have had a good deal of high water this spring. I wouldn't be positive as to our having a pretty steady flow since last August, butnothing like a heavy flow or of course I would have known it. Theriver has been up and down now so as to give us some trouble
7754 since, I think, in March. As to whether there is any marked or permanent difference in the level of the ground water at this time, in June, from what it was twenty or twenty-five years ago in this locality, I am inclined to think so. If the river has been having a good stream flowing in it since March and it has an effect upon the level of the water in the ground, as to why that level should not be re-established at its former point, I would say, I couldn't account for that unless it would take the water longer to percolate and get through the soil. In fact it is not full of water

all the time. As to whether it ever was full of water all the time, I will answer, a greater portion of the time I think it was.

I came here in the spring of 1874, and there was quite a good deal of water in the river then, yes, sir. That was the grasshopper year. As to whether the river in the fall of that year went practically dry, I wouldn't be positive as to the stage of the water in the fall of the year. I was camped on the banks of the Arkansas river from March until the 5th of August, 1874. The river prob-
7755 ably got very low in the year 1879, and also during a part of 1880, here at Hutchinson, not practically dry. I have never seen the river when it was absolutely dry here at any time.

As to what in my judgment is the difference between the level of the surface of the water at the time of the lowest flow that I have ever seen in the stream and the time of an average good flow such as I say we had in the earlier times, I would think that would vary, owing to the soil. I know where the variation has been from sixteen to eighteen inches. Yes, sir, I am talking about the underground water. But as to the difference between the level of the water in the flowing stream between the last time I have in mind and the time when it was flowing a good, fair, strong stream in the channel, I should say four and a half feet. As to whether a four and a half foot rise at any time would make almost what I call a flood, I would say I don't think so, no. As to the extreme
7756 variation I have known in soil as to the level of the ground water, or underflow as we call it here, I have known it to vary at different places in different amounts. I have known it to vary from eighteen to twenty inches. I know that very well. Nearly two miles away from the river. No, I don't think that is the maximum amount I have known it to vary. I think I have known it to vary more than that. The only way I could explain that would be to say that by taking a spade and digging down you would come to water within six inches of the surface. And when the river was dry you would have to go probably five feet or four and a half, and that was here in town. The place I have in mind right now is about three quarters of a mile from the river,
7757 and it is much closer to Cow creek. I should say probably about forty rods from Cow creek. Yes, sir, there was water running in Cow creek at that time. No, sir, I never saw Cow creek dry. As to why it is that I attribute this rise in the ground water to the river three quarters of a mile from the well and not to Cow creek forty rods from it, I don't think the water percolates out from the bed of Cow creek, and it is my notion that it does percolate from the river. As to why, if it percolates in, it should not percolate out, I would say I don't think the banks or the stratum of the bed—I don't think it is inclined for the water to run out. I think it would run in quicker than it would run out, probably. Yes, sir, it may be like one of these traps that you can get into but you can't get out. The volume is so very small in Cow creek as compared with

the river that it wouldn't have the force. Yes, sir, I know
7758 there was a contention of some kind at the time this canal ran from the river and turned its water into Cow creek and then took it out again below for the purpose of operating a mill, but I don't recollect just what it was. I don't remember whether the running of the water in that canal into Cow creek was enjoined or stopped in any way.

All of our lands here are increasing in value as compared with any former period within my residence here, and I think the country is quite prosperous now. I should say there has been an increase all the while in cultivated uplands in Reno county, and in bringing lands into cultivation. My judgment is that the bottom lands are more valuable than the uplands, situated the same distance from the town or from the markets and with equal improvements.
7759 As I say, I think the valley farms are the highest, especially on account of the underflow water which we think helps some crops. and I think that is true today, yes, sir. The valley farms as a rule are probably situated a little nearer the railroads, but not nearer the towns; that is to say, the high lands are as close to Hutchinson as some of the valley lands.

Redirect examination.

By Mr. ASHBAUGH:

As to how wide the Arkansas valley is at Hutchinson from north to south, well I should think probably eight to ten miles.
7760 As to the flow of the river in 1904 being even or uneven, I will say it was an uneven flow. We did have a period of excessively high water during the year 1904. There were several of them. Yes, sir, there was a flood in July, a very extensive, bad flood, that flooded the city of Hutchinson, and we had very high water in the fall at one time. Yes, sir, I have some things in mind that fix that. We have salt works located close to the river on the south side. When the river gets up of course we are more or less alarmed about our property, and it has always drawn my attention to that. Our superintendent always advises us. As to whether there were floods last October that washed out the Santa Fe tracks in New Mexico, I will say yes, sir, there was high water
7761 in the river here. I will say that the flow in the year 1904 in the river was remarkably uneven. Yes, sir, I was encamped on the banks of the Arkansas river from March to August, 1874. There was a good flow of water in the river during that time. We were camped in a little shanty right in the south part of Hutchinson, west of Main street, probably 200 feet from the banks of the river.

Yes, sir, we have wells over there at the salt works of which I am manager. I think one of our works is two and a half miles from the river. As to whether there are any wells at this salt plant there from which we can ascertain that the level of the water rises and falls,

I will answer, certainly there are. We have to supply a large amount of fresh water in the manufacture of salt and in the salt wells. We have open wells dug, about fourteen to sixteen feet across, and it is very easy to see the rise and fall of the water in those wells, and we have noticed it. As to how the rise and fall of the water in those open wells at our salt plant corresponds with the previous rise or fall
7762 of the water in the river, I will answer, well, it corresponds exactly. I mean that when the water comes up in the river the water will rise in those wells at our salt plants two and a half miles back. (Objection.) And when the water goes down the water in the wells sinks. We have an open well at one of our salt wells out there that we put down eighteen years ago. It is a mile and a half or a mile and three-quarters from the river, north, and when we put the well down it was along in May or June and the Arkansas river was up and we sank it down to where we had plenty of water and I told our men at the time I thought they hadn't gone deep enough for the large volume of water we needed, and
7763 they thought they had. Along three months later of course the well got dry. There was not any water in the river, and we had to go to work and sink that well deeper. I think we sank it, as I remember, nearly four feet to get a supply of water. As to whether the water rises and falls in that well according to the stage of the water in the river, I will answer, yes, sir, it does, and the water in that well is influenced by the river, regardless of any rainfall in the country. Oh, yes.

As to whether the bed of Cow creek at the point I spoke about noticing the difference in the water level near Cow creek corresponds with the level of the Arkansas river (objection), I will say I don't know absolutely.

As to the value of lands, I should say that they have increased in this county about in the same proportion that they have in every county of the State of Kansas within the last few years.

Recross-examination.

By Mr. DAWSON:

7764 This open well I speak of near the salt works I think is about a mile from Cow creek. No, sir, it is not between Cow creek and the river. It is still north of Cow creek, and I think about a mile and a half from the Arkansas river, and Cow creek runs between the open well and the river, yes, sir.

7765 SHERIDAN PLOUGHE, Hutchinson, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Hutchinson, and have lived in Reno county about thirty years. I came here the first day of February, 1876, and have been

here all the time except when I was away to school. I was away four years at the State university and other institutions. My business is the newspaper business, and I run a fruit farm. I have twenty-eight acres in apple trees, and I am interested with my brother—we have about 160 acres in the farm and we in a general way manage it together, but in the dividing up at my parents'
7766 death the part that fell to me was 28 acres of apple trees. But we have no strict division of the land but manage the matter together as best we can in order to get the interests together. I am interested directly in eighty-two and a half acres that I farm. There are about 2,250 apple trees on my land. There are a good many cottonwoods and other trees on the farm also. I would say I have 2,300 apple trees. The Santa Fe burned 391 of them on the first day of May of this year. My fruit farm adjoins Hutchinson on the northwest. It is in section 10, about two miles from where this testimony is being taken. As to how long I have intimately known the land around there, I will say my father bought it in 1884, and I have lived on the farm and worked on that particular piece of land since 1884. I have been interested and intimately acquainted with it ever since 1884. My father put up hay on a farm adjoining the river that is now owned by Frank Mar-
7767 tin. That is right on the river bank. From 1879 to 1884, I think. And I worked on the farm and worked in that bottom frnm the time I was about eight or ten years old until I was about fifteen. I was going to school in the winter and working on the farm in the summer. I have known the river and its condition and the land adjoining it and the conditions of the soil and the conditions of the vegetation and have observed that for eighteen years. Yes, sir, I have made a special study of raising fruits and of the soils and of the moisture and other conditions that go to make successful fruit raising in Reno county. I have given special attention to it. That was a part of my studies when I was in college—the special work I did in the university was along the line of sedges and grasses, and when I got into the orchards it was the conditions that would make a good apple tree and the conditions that would produce good fruit. As to the extent to which apples are raised in Reno county, I suppose there are more apples
7768 within a radius of five miles of Hutchinson than at any other point in Kansas of an equal area. Most of those are in the northwest, up in the river bottom. There are some apples across the river, but the great bulk of them is in the Cow Creek bottoms particularly and in between the river—or in the Arkansas valley. As a matter of fact the Cow Creek bottoms and the river bottoms are all one and the same thing. It is impossible to separate the river bottom and Cow Creek bottom. Cow creek is a small stream running through the bottom, originating up in the Hart hills northwest and drains that country and is a little winding stream that comes down through the valley and is simply a part of the water scheme from the river to the sand hills on the north. This

location I have given is all on the north side of the Arkansas river. The best fruit producing country is on the north side of the river. There is some fruit on the south side of the river, but it is not as extensive as on the north. As to the number of apple trees there are in this section, my judgment is that there are over a mil-
7769 lion trees. Yes, sir, some of them are large. The Yaggey fruit farm up northwest of here is the largest single orchard in the West or probably in the world. There are something like 860 acres. There are something like 3,000 acres of land in apple trees within a radius of four or five miles of Hutchinson in this particular northwest territory. Yes, sir, these trees can be seen from the Santa Fe and Missouri Pacific railroads as you go from Hutchinson to Sterling.

As to what changes in the Arkansas river and in the bottom lands have taken place since I have been acquainted with them (objection), I will answer, there has been a complete change in the vegetation—in the grasses—in the immediate bottoms of the river. In the early days when hay was the principal product here we shipped to Colorado. It was baled by Mr. Myton and bought by him
7770 and shipped to Colorado. The first grass we got was what we called three-corner slough grass. It is a very early, coarse grass. That has disappeared entirely from the bottoms and the grass that now grows in the bottoms immediately adjoining the river is the grass that we have on the uplands, a fuzzy-top grass, but the early, coarse grass that we could cut in June has disappeared entirely from the river bottoms, due to the fact that the conditions under which slough grass and coarse grass and grass of that kind would grow have disappeared from the bottoms. The river bottoms, as to width, would be, from a line northeast and southwest—take a line that way, at a point from the northeast at Hutchinson, I suppose between eight and ten miles wide and probably wider, possibly between eight and twelve miles. I think this width increases as you go further up about Sterling, but the hills veer to the south at a point about on the west line of the city of Hutchinson and then they seem to circle a little bit to the northeast and they become wider a little farther on. But at this particular point in Hutchinson I sup-
pose the valley is from eight to twelve miles wide and then
7771 gets wider as you go down the river. As to the changes I referred to, I will further state, the river itself has changed. The river bed has changed. The river bed in the early days was much wider. The channel of the river was much wider than it is at the present time, and considerably deeper (objection), and since the early days there has been a considerable amount of made land. Mr. Ayles, living up northwest of Hutchinson, has about forty or fifty acres of grazing land gained from the receding of the waters, and has fenced up the channel of the river and got it into his pasture, and that is true of all the people living up and down the river. The waters have receded and they have added land to their farms, and the river has more islands in it, much more, than there

used to be. There used to be one island out here in the early days, southeast of the town, that was noticeable in low water but
which would be covered up completely by the floods in June
7772 and July, but that now has grown up to an island covered
with trees, and the islands that have grown up in the old bed of the river to an extent of from one-third to one-half of the original size of the stream as it was in the early days—say from 1879 on—have trees growing up on them. These islands have grown over with trees and brush and shrubbery, and there are wild plums on some of them. As to when these sandbars that showed at low water began to show at high water and subsequently became permanent islands (objection), I will say they have been increasing ever since 1886 or 1887 or 1888—along there. Along about that time they became more prominent and the waters receded and trees have grown and trash has lodged on them and they have been constantly increasing in size. As to when they began to grow over with trees, just as soon as there was soil sufficient so that they could get of size enough so that the trees would grow in that locality. As to why the trees didn't grow earlier than that on them, I will answer, too much water. The water overflowed them
too much. As to when the waters of the Arkansas river per-
7773 ceptibly receded (objection), I will answer, along about the
time the islands commenced to appear—along about 1887, 1888 or 1889—gradually increasing and the water was gradually being reduced. Yes, sir, these islands and sandbars have been continuously growing ever since that time and are larger today than ever before and the largest I ever saw them, and getting larger all the time. As to what effect the recent high water of the last two or three weeks has had upon them, I will say, well, there is not any great volume of water there; that is, it looks big, but if we had the same volume of water coming down in the channel as we used to have it, it wouldn't make much of a showing. There hasn't been any great volume of water because the stream is so much narrower and so much filled up with islands, and some of these places lodge some brush and some drift in the trees, but it has never covered the islands—that is, the main islands. As to a long continuous high water, it has no perceptible effect upon the islands.

As to the flow of the river for the last ten or twelve years, outside
of excessive floods, compared with the flow of the river during
7774 the early years that I knew it, I will say it is now very much
less. (Objection.) As to the carrying capacity of the river to carry off flood waters now in comparison to what it was then (objection), I will say I do not suppose the river today will carry more than half the flood waters it used to carry, because it has been filled up so much. The channel of the river has been so narrowed. If the same amount or volume of water should now come down the river that would simply have filled its banks in the early days, as to what effect it would have (objection), I will answer, it would flood the whole bottom.

Yes, sir, I know something about what is known as the underflow. As to how far back it extends from the river, I will say that to my knowledge it extends back to our irrigating wells. I have no absolute information further than that, but I know it ex-
7775 tends to our irrigating wells, and they are about a mile and three-quarters directly north of the river. As to what effect a rise and fall of the water in the river has upon the underflow at that distance, I will say the water rises in our irrigating plant—in our wells—as the river rises, and it goes down or recedes in the well when the river runs out or when the water runs out of the river; and that is regardless of rain, yes, sir. Rainfall don't affect the well much. The only time we have ever had a rainfall to affect the water in the well was last July when we had eight inches of water fall in six days' time. Then for a while the water stood high in the irrigating well, but it was the only time I have ever known the rainfall, which was so exceedingly great, to affect the water in that open well. Yes, sir, that was the rainfall that caused the flood of July, 1904. It was local; it was not general. It was a local excessive rainfall, within a radius of twenty-five miles of Hutchinson, up the stream.

7776 As to which is higher, the bed of Cow creek or the bed of the Arkansas river at a corresponding point, I will answer, the river. As to whether that is true all along Cow creek down to its mouth, I will say, well, at the mouth it comes to a level with the river and flows off into the river, but above that it is lower than the level. Yes, sir, Cow creek is a perennial stream. When there are no local rains and the river has a good flow of water in it the water in Cow creek then increases in volume. If there are no local rains to affect it and the water in the Arkansas river goes down, then it decreases the volume of the water in Cow creek. As to which affects the other—whether the Arkansas river affects Cow creek or Cow creek affects the Arkansas river—I will say, well, the water in the river affects the creek. As to whether the bed of the Little Arkansas river is lower or higher than the Arkansas river at a corresponding point, I will say I am not so intimately acquainted with that. I know the Little river only in a certain section, and from some things I know about the Little river my conclusion would be that the Little river is lower than the Big river. As to how the land slopes a short distance from the northeast bank of the Arkansas river toward the Little river (objection), I will anwer, the
7777 ground slopes toward the Little river from the Big river. I think the Little river at the place I know it is a perennial stream. As to what extent, so far as I know, the Arkansas river affects the Little river, I will say, well, it feeds the Little river as it feeds Cow creek, but not to the same extent, because it has farther to go. During the last ten years, as to how the level of the underflow in all this country has been affected, so far as I know (objection), I will say, my information is local to our farm and the valley and the country right around the farm and the water level is lower.

The water that we strike is lower than it was fifteen years ago, to the extent of something like three feet. As to the flow of the river during 1904, I will say, it was unusually heavy and unusually
7778 uncertain. I mean by that there were two or three periods when the river was very high. One period particularly that affected us. That was in the fall. It was high twice. We had two times when it was high in the spring, in June and July, or along in the spring and summer, and then it was high in the fall and the flow was irregular; and otherwise—it was up and down, but three distinct times I know it was high. Yes, it was high in the flood of July. I don't remember of ever a time in the history of this country when it was as high as that before. Yes, sir, I remember the flood of 1877. It was not as high. The water in 1877 was higher than the water that we had in the city of Hutchinson in 1905, but it was not as high as it was in 1902 and 1903, the years previous. But that came from the creek. We had excessive rainfalls. It came entirely from the creek. The flood of last fall was in October, because we were picking apples at that time. Yes,
7779 sir, that flood was high and interfered with traffic. No, sir, those are short floods, and that is what I mean by the irregular flow of the river. It was very high for a while and subsided and then came up again. We had that about three times. That would make the aggregate flow for the whole year very high, yes, sir. As to what the condition of the flow of tha river was outside of those three floods, it would be medium.

As to what effect the falling of the underflow had upon our apple trees and our apple orchards (objection), I will say, the lowering of the water affected us materially, because the strain on an apple
7780 tree comes in July and August when it is hot weather, and if the leaves can't take the moisture out of the atmosphere and get the moisture from the atmosphere and there is a continual draft on the roots the result has been that apples fall in excessively dry weather when they can't get the water up from below as readily as they ought to have it. The result is that the apples fall. As to why I say this is a fine apple section, there are two things—the peculiar qualities of the soil, a sandy loam that is strong enough to produce a big tree and produce a big apple, and also the fact that the roots go down to the water and can withstand the dry weather that we occasionally have.

As to what effect it would have on this whole apple section if the flood waters that come down could be impounded in reservoirs in Colorado or in Kansas and used for irrigation and the flow of the river during the balance of the year be allowed to run at its
7781 normal stage (objection), I will say, if the water could be put in the channel of the river that we had in the former times in equal amount, the effect would be to raise the water level and increase to a very large percentage the productiveness of the apple trees. The flood of last October came from the west. I don't
7782 know where it came from. It was not due to local rains. We

had some rains in October, but they were only local and were not sufficient to affect the flow of the river, no, sir.

Cross-examination.

By Mr. DAWSON:

I suppose that the irrigation well I spoke of is a mile and a half to a mile and three-quarters directly north from the river. No, sir, Cow creek is not between it and the river. Cow creek is half or three-quarters of a mile from the river, north. The only levels we ever ran were on the ground. We ran some from Cow creek over
to our place to see if we could get some water to use for irri-
7783 gation purposes. No, sir, I never ran any levels from Cow creek over to the river.

Q. Then when you say Cow creek is higher than the river it is not because of any levels that you ran across between the two?

A. No, sir, because I have seen the water running from the river to Cow creek. It ran down the old mill channel for years at a race-horse speed. The canal I speak of ran directly east and west on the section line. It certainly was about eight feet to the mile higher up on the river than the point where it discharges into Cow creek. Well, I suppose it was farther up the river. No, it didn't run at right angles to the river—it was an acute angle.

I was nine years old in 1877. My apple orchard is on the up-
land, and it is about eight or nine feet to first water. Well,
7784 now, that would depend. During the last week or two it is about eight or ten feet. Yes, sir, that is about three feet lower than it used to be. No, sir, I don't know that to have water close to the surface is bad for apple trees. The only apple trees I have ever seen killed were apple trees that were in the way of this flood two years ago and the trees were so located that the water couldn't run off or drain from them and the hot sun beat on them and cooked the apple trees, but those are the only apple trees in all this valley up here.

(Counsel for the State of Colorado refuses to further cross examine this witness because he does not consider the direct testimony as proper rebuttal.)

Redirect examination.

By Mr. ASHBAUGH:

7785 Yes, sir, I remember a time something like ten years ago when the Arkansas river flowed across to Cow creek through the city of Hutchinson and washed out some trees. I think that was about eight years ago. The river was up and the high water came across the draw southeast of town, went across the country and washed out the trees, and ran back, some of it, in the creek—into Cow creek—and particularly at a point south of the water works. The whole of Avenue A west was washed out by it. As to whether

Cow creek in the city of Hutchinson by actual levels is lower
7786 than the Arkansas river at a corresponding point (objection),
I will say, an engineer made a survey along the ditch at Hutchinson intended to drain the surplus water from Cow creek to the river. I saw the levels of the engineer's survey the other day. It shows at any time during the last high water that the water would be running back into Cow creek at Eighth street where they proposed to take the water from Cow creek and run it to the Arkansas river. (Motion.)

7787 HENRY HARTFORD, Hutchinson, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Medora township, Reno county, Kansas. That is north east of here, on the Rock Island road running from Hutchinson to Topeka. I have lived there since 1872, and am farming and stock raising. I have about 1,640 acres of land. I do considerable stock business. The Little Arkansas river runs through my farm. It runs through four quarter sections, that is, meandering through that distance. The Arkansas river at its nearest point I think is
about ten or eleven miles or probably a little more from my
7788 farm. I am not positive, but I should judge about that. The
Little Arkansas river is ordinarily a small stream. No, sir, it never has gone dry in my time. I have never seen it dry. I have been there since 1872. It never goes entirely dry. Where the Little Arkansas river runs through my farm it is lower than the bed of the Arkansrs river at a corresponding point across. (Objection.) As to which way the country drains between the Little Arkansas and the Arkansas across there, I will say it drains into the
Little river. As to how much lower the Little Arkansas is at
7789 Medora than the Arkansas river is at Hutchinson, I will say
it is forty-five feet lower, according to the Rock Island survey. It was something strange to us for years and years what caused the changes in the Little Arkansas river. As to what these changes were, why, less water than had previously flowed in the Little river. As to what effect the condition of the water in the Arkansas river has upon the water in the Little Arkansas river when there is no rain to affect either (objection), I will say the Little river is always lower. If there was no water in the Big river there wouldn't be as much in the Little river. As to whether the amount of water in the Little river corresponds with the amount of water in the Arkansas river, I will say I should judge that it does correspond
to some extent, yes, sir. As to there being springs along the
7790 Little river, I will say yes, sir, there used to be a great deal
more than there is now. These springs are on the south side of the Little river altogether. Men in my business used to think it was one of the finest streams for stock there was in the country, on

account of the good water it afforded. That water we concluded came from those springs. (Objection.) We could see that. Of course we could see it, but we didn't know—— Yes, sir, the water from the Little river was fed by these springs, and those are all on the south and west side of the Little Arkansas river, yes, sir.

Yes, sir, there have changes taking place in the amount of water flowing in those springs at times when there was no rain to affect it in later years. Lots of them have dropped off, and instead
7791 of a spring it is now a kind of a quag and dangerous for cattle to go around there. As to what I attribute that drying up of these springs to, why, we attribute it to not so much water coming down the Big Arkansas river. Yes, sir, that is the conclusion of all of us over there, based upon my observations of these thirty-three years, and that is my conclusion, yes, sir.

(Colorado declines to examine the witness as there is no testimony given by the witness which may be classed as rebuttal.)

As to making one further statement, I will say, I have been haying there since 1875 on sections 6, 18, 23 and 3, paralleling
7792 the river, and in the early days in stacking hay we could get water by simply carrying a spade and post auger with us at the stack. In recent years we have to go about eight feet to get any kind of decent water. We were provided with good drinking water for years and years there, but now we have to go eight feet for it, and not as good water as it was then. As to how long ago it was that I noticed this change in the decrease of the water, I will answer, oh, I think it must be fourteen or fifteen years, I guess.

Cross-examination.

By Mr. DAWSON:

As to what I attribute the change in the Cow Creek water to, as to its not being as good as it used to be, I will say, I thought it was surface water, yes, sir, and yet it was farther from the surface than the old water that we used to get.

7793 L. A. BIGGER, Hutchinson, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Hutchinson, and have lived here continuously since 1873. My business is bonds and loans. I was formerly handling lands. As to how extensively I have handled lands in this and adjoining counties, I will say, well, we sold the Santa Fe lands all along this county and a great deal in other counties in a line west here. That business extended up to 1885; not much since then. During that business I was familiar with the Arkansas river through this and adjoining counties. From 1872 to 1885 I used to

cross the river almost daily. I would say twice a week any-
7794 way. Since that not so often.

As to how the river flowed in those early days between 1872 and 1885, as I remember it at Hutchinson, the river used to rise in May regularly and continue to flow full to half full banks to about the 20th of June or perhaps the first of July. During the balance of the year it would be very low, but always flowing some water, with one or two exceptions. In one or two summers it went dry; that is, so much so that you could walk over it for a few days. During the first fifteen years I knew it the river at Hutchinson was about 1,600 feet wide. I know that by the length of the bridge, but I don't think it was quite so wide either above or below here. But when the river was up during the period of spring rains it flowed the entire width of that channel. There was possibly a sand bar
7795 here and there, but nothing like so much as at present. As to the changes I have noticed in the flow of the river and the banks and the bed, I will answer, well, the river has been narrowed down, especially at this point, I should say 500 feet or more in width. The bed of the river undoubtedly has been raised by the filling in of sand and the growing of islands. They have increased, I should say, three-fold, and as to the islands, there are more islands in the river, because there is not enough water to wash them out. As to the formation of sandbars and islands (objection), my belief is that the winds carry the sands in knolls, like, in the river bed, as it would on dry land, and there is not enough water to destroy them or wash them away. Yes, sir, during later years there has been a marked growth of trees on those islands, especially in the last ten or fifteen years. I myself, right here at the bridge where the main channel used to be—it has filled up and I have planted trees there and there are some four or five acres right at the bridge, a nice growth of trees, and it has filled up pretty nearly full and never overflows any more. As to why those trees did not grow in
7796 the bed of the river twenty-five or thirty years ago, it was because there was too much water and it flowed too swiftly and it washed them out. I began to notice the growth of islands and the trees about ten or fifteen years ago. I couldn't tell you anything about the year, because it was just general observation on my part.

As to the carrying capacity of the river at the present time compared with the carrying capacity in the early days, the water
7797 being at the same height as measured by the banks (objection), I will say the carrying capacity at the present time is not so great, I should think by one third, judging by that part of the river I am familiar with, which would be say from here to Dodge City, and from here below I haven't had occasion to be along it very much. Yes, sir, our lands were mostly west. At Mt. Hope we had lands, but we hardly ever touched the river. Yes, sir, I have owned considerable land in this county, as much as any one man, I presume. We have owned thousands of acres along the

Arkansas river, but not all at once. We bought and sold lands right along.

As to the average flow of the Arkansas river during the last ten or fifteen years as compared with the average flow during the first ten years, exclusive of floods (objection), well, it is no uncom-
7798 mon thing in recent years to drive across the river at most any point. In the early years we rarely ever ventured to ford the river except at well established fords, because of quicksands, which at that time were very common and dangerous, and because there was flowing water and the river was swift, what there was of it, and the sands were heavy, and it was not fordable; that is, it was not safely and easily fordable. It was, possibly, fordable.

Yes, sir, I know what is understood in this country as the underflow. I have heard it talked of and have read about it ever since I have been in the country. As to how far back the underflow is influenced by the amount of water in the river, well, the land as far out as twenty miles from the river that I have owned about the year, I will say, 1893—I was obliged to put all my wells deeper on the lands I then owned, and we also controlled considerable land for eastern people as well. I wouldn't say that was universal, but it was pretty nearly general, that we had to sink our wells deeper,
7799 because the water became so exhausted, that is, so little that it wouldn't take care of the stock. As to water in wells and pools, etc., and as to the level of the underflow back from the river corresponding with the amount of water in the river (objection), I will say I always believed the river affected our wells, but I couldn't give you any scientific reason for it, but I say I believed it did at that time, and the basis of my belief was the very fact that the wells began to give out and that we had to seek a lower level for them when there began to be complaint about the water in the river. As to those wells being higher or lower at different times (objection), I will say the water was always more plentiful
7800 in the wells I speak of when the river was high, and when the river was low the water was lower in the wells, although after I sank my wells I had no particular difficulty, and haven't yet. Yes, sir, these wells were sunk deeper, and hence there would be a more abundant supply. As to whether the water in those wells was deeper when the water in the river was higher than it would be when the river was lower (objection), my recollection is that they were. I couldn't give you a specific case, however. As to
7801 whether the water in the river affects the cellars in the city of Hutchinson, well, yes, it undoubtedly does. In my own case, I have a cellar here. Just two weeks ago when the river was full my cellar, the cement on it was a little defective and it came up three or four inches of water, maybe five inches, in the cellar and as soon as the water went down—that water was just as clear as spring water, too, and it came in through the bottom of the cellar—and when the river went down it went away, all except little holes in

the bottom of the cellar where it couldn't get out. No, sir, the water in my cellar was not affected by any local rain. The rain never affected it when the river was low. It is the general pressure of the underflow that caused it. My residence is on Sherman street east, No. 309.

Yes, sir, Cow creek flows through the city of Hutchinson,
7802 between my house and the river. Yes, sir, Cow creek enters the Arkansas river six miles below here. My house is close to a mile from the river. It is three-quarters of a mile from here to the river. My house is 1,600 feet from Cow creek. As to the condition of Cow creek at the time the water in my cellar rose, well, there was hardly any water in the creek; about the same it is today. No, sir, the water that was in my cellar could not have come from Cow creek, because Cow creek had been in that condition for weeks and my cellar was not affected. (Objection). Yes, sir, I am acquainted with the valley of Cow creek. As to whether it is above or below the bed of the Arkansas river at a corresponding point, generally speaking, I should say it was below. As to whether Cow creek is affected by the condition of the water in the Arkan-
7803 sas river when there is no rain so as to affect either of them, I don't believe I can answer that question. I can explain why. I have known Cow creek to go up here when there was no rain here at Hutchinson but probably were rains say fifty miles west of us, and hence the cause of the rising of it I couldn't tell. Cow creek is something like sixty or seventy miles long, probably more than that by the winding of the stream The land on the north side of the Arkansas river I should say slopes toward Cow creek The land east of Hutchinson and between the Arkansas river and the Little river, is very flat, but what little slope there is is away from the Arkansas river. There is no tributary stream that I recall except Cow creek that empties into the river for twenty-five miles down the river. Cow creek, understand, runs parallel with the river for a number of
7804 miles before it empties. Yes, sir, there is a slough which has the local name of Kissaway creek. It is a slough that don't run the year round. I think it empties into the Little river. As to the bed of the Little Arkansas river being higher or lower than the bed of the Arkansas river at a corresponding point (objection), well, I had levels run, but I have really forgotten. The Rock
7805 Island road gave me their profile, and if I could find it I could tell you to the foot, but I have forgotten. As to the drainage between the rivers, when you get six or eight miles from the Arkansas river east of Hutchinson, going north, it slopes down to the Arkansas river, if you please, from the foot of the sand hills, as we call them. The sand hills is a long ridge, forty or fifty miles long, and has an elevation of over 100 feet. The water from the top of those hills goes the other way, into the Little river. Yes, sir, I have noticed springs along the Little Arkansas river. They are

on the south and west side of it. I have had lands on the
7806 Little river, and they are on the west side. As to how far back the flow of the water in the Arkansas river affects the level of the underflow, from my observations as to wells and pools and streams, etc. (objection), my belief is that on the south side it affects it at least twenty miles. I base that on the conditions of the wells, the condition of the streams, the condition of the marshes south of Great Bend, the condition of Salt creek and all those streams I have been in the habit of travelling along. Upon the north side it doesn't extend so far. There seems to be a different formation there, and it would extend about ten miles. The Arkansas valley from northeast to southwest, crossing the river at right angles
7807 at Hutchinson, is about eight or ten miles wide. It widens sharply as you descend towards Wichita, and widens mostly on the north side at Hutchinson, for about twenty miles, mostly, then on both sides.

Cross-examination.

By Mr. DAWSON:

No, sir, I have no notion as to how fast this water I call the underflow travels through the soil. Yes, sir, I have made investigations. No scientific investigation, understand, but I have been interested in the water company at Hutchinson. We have sunk wells, and the question of the underflow is quite an important one to us, and we made some little experiments. For instance, we would put a chip on the north side of that well, and in all instances it would finally land at the other side, almost an imperceptible motion, but if you put a chip at the southwest corner it would never go back, showing it was not an eddy. But I know nothing about the rate of travel. I couldn't tell you about that. Yes, this chip was travelling across the surface of water which had been freed from the
7808 soil and was open. Yes, sir, this underflow extends into the ground, that is, the depth of the stream is about 100 feet. It is 100 feet to bed rock, and according to my view it extends twenty miles south of the river and ten miles north. That is as far as my observation goes. It may go farther, but that is as far as I have had any opportunity to know, and that would make, then, an underground flow of thirty miles wide and a hundred feet deep. Yes, sir, from a common source. And what didn't come from the rain, yes, sir, is supplied by the Arkansas river. I don't know of any other source. I couldn't tell you the proportion of this underflow
7809 that comes from the rain locally and from the rains on the broad plains and that comes from the real flow of the river, but I should say a very important proportion from the flow of the river and the tributary streams that flow into it. Yes, the reason I think this underflow extends back as far as twenty miles south is because after I had wells there for a time they went practically dry and I had to sink deeper.

I came to Kansas from Ohio. Yes, sir, I have been back there As to whether I know it is a fact in Ohio and in any other State with which I have been acquainted that as the country has been settled up and put into cultivation generally the level of the ground water—the water in the ground—has sunk and many springs that existed when the country was a new and wild country have dried up, I will say I think that is true in timbered countries like Ohio and Indiana, but if it is true in Iowa and Illinois that the level has sunk as the country has become generally cultivated under the plow, I will say, I am not aware of it. I will not say it is not. No, sir, I don't know about that. Yes, sir, it is true that between the
7810 time I first sank these wells I speak of, twenty miles south, and the time I sank them deeper, a large area of the surrounding country was broken up and put into cultivation. Yes, sir, and the same general proposition would apply to the south side. My cellar had water in it about two weeks ago when the river was full here the last time. No, the river has not been pretty full all the time for the last month. It went down. It was not down yesterday, but it has been falling.

Yes, sir, Cow creek is between my place and the river, and I think Cow creek is lower than the river at an opposite point. I don't think Cow creek has anything to do with my cellar water, no, sir. Cow creek at that time was low, like it is now, just exactly,
7811 yes, sir. If that is a fact, as to how I account for the answer I gave to counsel a short time ago that when the river was high Cow creek had more water in it, I will answer, yes, sir, the creek has a channel and would carry it along as fast as it would percolate, I should think. But there is no channel out of my cellar. Cow creek is not perceptibly any higher now than when the river was low. I don't remember saying to counsel that I thought a part of the flow in Cow creek when the river was high came from the river and that the flow of Cow creek was affected by the flow in the river. I wouldn't think the flow of the river would affect a channel like Cow creek. I don't see how it could, much. But this underflow—if you want an explanation of that—there can't be any doubt in my mind that this underflow does come not only under Cow creek but under the river itself. Now, I am not telling you
7812 this unless you want to hear it. We had a fine well—there is a bridge right at the end of Main street. Just north of the channel is a grove and a park that I own. I had the finest water in town from driven wells, finer than it was up here even. When they built the salt works on the other side of the river the water in my well became salty and unfit to drink. That was one evidence in my mind that the underflow penetrated very deep. Yes, sir, it is quite true that water moves underground in every country—in all countries. I think so. As to whether in my opinion all of this water moving through the ground comes from the river or from all sources, I will answer, oh, not all of it, of course not. The salt well is about half a mile from my well, up the river. I expect they

would allow the salt water to run on the surface of the ground, though, some. It was several months after the salt well was struck or opened that it affected my well. It was not immediately. It must have been six or seven months.

7813 Q. Then as testified by Professor Slichter of the United States Government and Professor Carpenter of Colorado, it would travel at the rate of about a mile a year, would it not? (Objection.)

A. Well, as to the rate it travels, my testimony would be of no value, for I absolutely do not know.

Yes, sir, it took about six or seven months to go about half a mile, from the salt well to my well. There was such a vast quantity of marsh water between us that I should judge it would take it quite a long time to impregnate the other water.

No, I don't think Cow creek is lower than the bottom of my cellar. I don't hardly believe it is. No, sir, I don't think my cellar is as deep as the depression of Cow creek. As to whether the bed of Cow creek where the water is—the surface of the water—is lower than the bottom of my cellar or whether the cellar is lower than the surface of the water, I will say, I don't know which is

7814 lower, but I should say they are about the same. My cellar is about six feet deep. Yes, sir, the water that came into my cellar was clear water. No, the water in Cow creek is not clear now; it generally is. As to whether it was clear when the water was in my cellar, I will say, well, I don't know. As to whether it ever gets clear, I will say, it used to be a very clear stream, but I think not of late—the last year. There are so many people fording it and so much stuff thrown in that it is not like it used to be. Yes, sir, my information is that Cow creek is lower than the river; that the water in my cellar came across, percolating through the ground, and went under Cow creek. Not up into my cellar. On into my cellar, yes, sir, the same as it came across the river from the salt works and spoiled my well, exactly. Yes, sir, this salt

7815 well I spoke of was on the opposite side of the river from a well of mine which it spoiled. That is what surprised me. Now, I think the water will percolate like an inverted siphon, for instance, but it can't get higher than the source. As to the direction the flow from the salt well would be to get to my well, I will say, the river runs southeast and this would be almost due east. Yes, sir, that water travelled almost due east, or must have travelled almost due east to get in the shortest direction to my well. I should judge so. The general drop of the country here is from west to east. And as to my observation of the condition of this salt water, as to whether it followed the drop of the country regardless of the river, I will say, it must have come in a straight line to my well, because it got there. No, that is not true, of all the movements I ever saw or had any evidences of in the ground water in this country—that it drops with the general drop of the country. It is the course of least resistance. As to whether that is not the least resistance, as a gen-

eral proposition, with the drop of the country down hill, I will say it is, but wherever there is a fissure or line the water would undoubtedly follow it.

7816 Yes, sir, these springs I speak of coming out on the south and west side of the Little river come out really on the up hill side, as the general fall of the country is. I should say that is true. That is, from the Little river to the foothills is probably lower where I noticed these springs, to the foothills, about a mile away, than it is on this southern slope where the springs are.

As to whether when I first started in here to handle railroad lands I advertised to the people that these were good lands to buy because of the underflow, I will say such advertisements were made. I don't know about my own. Yes, sir, that was pretty generally used to attract settlers. Sub-irrigation was the great theme. As to a good deal of the notion as to this underflow having been the outgrowth of often reiterated statements in advertisements that it existed, in my mind and to the minds of others, I would say no. The more I have observed it—at first I didn't believe it, but the more I have

7817 observed it, I am satisfied it is true. As to whether there is any difference in the underflow here now and at any other time, and as to our still having an underflow, I would say, oh, yes, we have an underflow here, undoubtedly. It is the only source we have for a reserve supply of water.

As to what the annual precipitation is here, I only know from the published reports and I wouldn't remember them accurately enough to tell you. As to the average for the year, I would say 28 inches, I think, about, at Hutchinson, and as you go west it is less. As to all the country lying on the uplands in Reno county having been settled, and as to its now being practically all under cultivation, I will say it is all under cultivation, that is, as much as any country could be. As to whether the uplands here rely on any ground water or underflow, I would say it seems to me it does. For instance, our crops are better—now, take it along from—well, from Mt. Hope twenty miles below here up as far as I am acquainted—well, to the Colorado line—the crops near the river are better, and that point narrows down as you go up the river until it comes to a narrow valley. As to whether the uplands rely on the underflow, I

7818 would say, that is what I say. I say they must have relied on the underflow. I think so on the uplands, because as you go away from the river the crops got more uncertain.

Q. But I say, do they get any benefit from the underflow? Do they rely on it there on the uplands?

A. The second bottom we call it here.

Q. Yes.

A. There are no high uplands in this vicinity. The sand hills are the highest.

Q. But is there any place in the country where there are what we call uplands, where it is fifteen or twenty feet to water?

A. Oh, yes.

Q. Well, they do not rely on the water under ground, do they, to make their crops? They rely on rainfall, do they not?

A. Yes, they rely on the moisture in the ground wherever it comes from.

Q. But they do not rely on any underflow like you rely on here in the valley, do they?

A. Oh, no, I don't think that is true.

Q. They rely on the rainfall, do they not?

A. Well, not entirely, I don't think. I think there must be a movement of the water toward the surface, even from twenty to thirty feet, the fact that tree roots and things go down. We have had instances of roots going a remarkable depth.

7819 As to what I consider the best and proper height for the water to come to the surface, that is, for the land to be above the water, I would answer, ten to twenty feet above the ordinary level of the standing water is better than down three or four feet, except for fruit, perhaps. As to how far it is to water in these later years, that is, in 1904, on an average through this broad valley across these twenty or thirty miles I have spoken of as containing an underflow, that is, until you strike the first water, I would say the first water you get at about twenty or twenty-five feet, but you don't get a plentiful supply at that depth.

Q. Well, I am talking of this water under the ground now, not for drinking water. What is this first water across the valley where you say it is twenty miles south and ten miles north of the river—what is the first water level you strike where you get water?

A. Well, that would be where you get water where you have a well?

Q. Well, you might go deeper to get a better class of water?

A. Oh, yes.

Q. But where do you first get water?

A. At about twenty feet.

Q. Right out here in Hutchinson can you not dig and get water at less than twenty feet.

7820 A. Oh, on the bottoms, yes, sir. Oh, yes, you will get water here in about six or seven feet.

Q. That is true now, is it?

A. Yes, sir. Eight feet anyway.

Q. How was it thirty years ago?

A. Well, thirty years ago—I think the water right here at Hutchinson has fallen about thirty inches, would be my belief.

No, we have put in no storm sewers. We put in sewers for the waste water of the city. Yes, there were trenches dug in which to lay the sewer pipes, but there is no ditch except ditches that were dug to lay pipe in. Yes, sir, that is all.

Outside of the town of Hutchinson in these bottoms within a mile of the river, as to how deep one would have to go to get water, I would say the same rule applies, except if the ground rises a little it would be a little deeper to water, that is all. As to whether I

think there is an underflow, as I call it, back for five or ten miles northeast of the city that is affected by this Arkansas river, I will say, yes, sir, I do, but I don't believe it goes right from here.

7821 For instance, I don't mean to say that there is a stream from Hutchinson straight across to the Little river, or underflow, but that it comes from Great Bend, if you please, that way (indicating). As to whether I have any notion as to whether it comes from the river or keeps on coming, like our salt well did, from somewhere on beyond the river and even across the river, keeping on the down course all the time, I will say, well, it is the general pressure from Colorado down to this place. In other words, the rains and snows fall upon the ground in Colorado, yes, sir, and a certain part of it comes down, yes, sir, and across the whole broad area it appears down here in its movement. Yes, sir, the whole thing has something to do with it. And it moves slowly, yes, sir. But I can't tell you how fast.

7822 No, I do not mean that this thing that we call an underflow is an underground stream running in any well defined channel like a stream on the surface. I do sometimes think that is true—that is, that there are little distinct streams, little crevices here and there, yes, sir, from the fact of the water being so much colder in those wells than it is say right here in Hutchinson and other points, that it must have come for a long distance through some channel, or from a greater depth, yes, sir.

Q. But I mean this first general level of the water that you strike when you dig in the ground. Do you have any idea or have you ever had anything to lead you to believe that that whole body such as you have described as extending twenty miles south and ten miles north is running in any definite channel or generally percolating through the soil down hill?

A. In a general way I should say it was percolating through the soil.

7823 As to whether there have ever been any better values of land generally along in the valley in Reno county than there are now, I will say, the lands today are worth about what they were in 1887. That was the high time of lands. And then they began to decline and now they have got back to where they were in 1887. As to whether in the loaning of money on lands we loan any less or look upon them as of any less value because there has been any change in what we call the underflow, generally speaking, I don't think we are taking that into consideration. We were much alarmed for a number of years, but we have had good crops in the last six or seven years on an average. Our crops have been very satisfactory. No, I do not remember a time when for six or seven successive years we had any better crops than we have had during the last six or seven years on an average.

Redirect examination.

By Mr. ASHBAUGH:

As to the bottom lands being more productive in corn when the underflow is thirty inches near the surface than when that underflow has fallen thirty inches (objection), I will say I think we have had about as good corn. Our corn crops have not been as good as our wheat crops, you understand. But I could hardly say that the crops have been diminished greatly by that lowering of the
7824 depth of the water. As to whether I think that the lowering of the depth of the water has affected the bottom lands as to hay (objection), I will say, right here at Hutchinson I couldn't say that it has made any vast difference. As to the water level falling under the first bottom lands thirty inches and that being my estimate, (objection), I will say, yes, sir, in the neighborhood of Hutchinson. But as you go out from the river I think it has fallen a good many feet. The resistance being greater, I think the water must have fallen a great many feet. Otherwise we would not have had to put our wells so low. As to where I got the specific statement that the underflow extended to 100 feet in depth, well, in boring for salt here I took measurements and I think it was 100 feet to bed rock. Yes, sir, that was right around Hutchinson here within a space of
7825 three miles. As to what I meant to state to counsel about the underflow being 100 feet deep for twenty miles wide, I would say, well, I meant particularly around here where I was acquainted, but it must be a 100 feet to it there, because some of our wells are seventy feet deep. I don't know of any wells out there a hundred feet deep. As to whether I know of any wells back from the river that are a hundred feet below the surface of the water, I will say, oh, no, I don't know of any wells that deep. As to whether I meant to say that the underflow was a hundred feet deep back from the river, oh, I couldn't say about that.

As to the condition of the country in Ohio, yes, sir, they drain the country back there in ditches and tile it. As to the
7826 country here having been drained or tiled in any way, I will say, there is no tiling that I know of, and very little ditching. As to the salt well and as to whether I know when the salt water got out of that so as to start on its course down stream (objection), I will say, well, I don't know when the salt began to be thrown on the surface nor anything only the fact that it was quite a lapse of time from the time the well was first put down until the water began to be tainted, and then it kept getting worse and worse. No, sir, I don't mean to say that the water went right across from Hutchinson in the underflow to a point in the Little river. Mentioning, then, that it might have come down from Great Bend, and as to my meaning Great Bend only, I will say, no, I meant that as an illustration. The way I believe it is that it starts—the river being the sur-
7827 plus or reserve—the reservoir, if you please—that the bulk of it starts from there, originating in the rains and finally

being deposited there, and from there it begins to force its way. It s always hunting a level and forces itself in the direction of the least resistance and to the lowest point. As to meaning by Great Bend any point above on the river (objection), yes, any point above or below Great Bend. But what I meant was—I didn't mean to say that the water ran from Hutchinson toward the river. As to its coming from the river at any point between Hutchinson and up the river where it would be determined according to height, I will say, yes, sir. To illustrate: Five miles due west of Hutchinson here, on a kind of a high point where there are wells that are pretty nearly a hundred feet deep, I wouldn't say how deep, but in the neighborhood of a hundred feet deep, it is solid clay, if you please, from the surface, practically, down until they strike water, but they are up on a hill. And then
7828 when you go to other points you have a distinct sandy subsoil. There the water comes up and the wells are only a few feet deep—fifteen feet, for instance—until you get beyond the bluffs. As to how I explain that the water in some wells is colder than in other wells (objection), I will say I know it to be a fact, but the reason for it I just couldn't tell you. As to how extensive that fact is, well, it is rather exceptional. For instance, I know that not only my well but a neighbor's down there half a mile from me was in the same fix. They had the same amount of water, and then again up in the sand hills we have softer water than we have here, and I should say a little colder. I have never tested it except by the taste, which led me to believe there were distinct channels for those particular wells. As to whether I call it an underground stream or an underground current, and as to how I think this water courses its way on down through the ground beneath (objection), well, the question is not exactly clear to me, and I don't know just what you want.

7829 Q. Counsel, for technical purposes that are best known to the attorneys in this case, got you to state something about the water not coursing in underground streams. Now, I will direct your attention to that, asking you to restate that as you believe it is. (Objection.)

A. I am satisfied that the underflow is not only in distinct streams that do not percolate beyond a certain distance, but that there is a percolation besides in other districts. For instance, in a
7830 sandy soil like at Hutchinson—sand and gravel to bed rock—it would be percolation. In other places it would be confined to distinct channels. What makes me believe that is, you go up here on Salt creek and south of a certain line the water is just as fresh as it is in Hutchinson, and then the minute you cross that line you will find brackish water; that is, they drink and use it, and stock drink it, but still it is brackish, so much so that you would notice it. And the salt marsh where the deposit of salt is, so far as we know, is probably forty miles west of that point where the brackish water appears to originate.

As to whether there is better farming now in this country than in the early days, I will say, there is, undoutedly. As to whether lands all over the State have risen in value and property values in general have risen in these later years, I will say, yes, sir, and all over the United States as far as I can learn.

Recross-examination.

By Mr. DAWSON:

Q. Mr. Bigger, in just now speaking of the dividing line between fresh water and brackish water up here, do you mean that there is probably some character of soil that makes the dividing line between them?

7831 A. Yes, or rock or something that they cannot mix with.

Q. But what I want to ask you about is this underflow, as you call it, moving in defined channels. Have you ever seen anything that led you believe or gave you any reason to believe that there were any well defined underground streams—I mean by that a restricted and contracted channel where it was a running stream and not simply working through the soil?

A. Well, yes, that well I speak of was one thing that made me believe it, this well being of a different character than wells right here at Hutchinson.

Q. Well, you struck no open channel, did you?

A. Well, no, I don't think there was any open channel, but I think the water at that point must have come from below to the surface, out of the mouth of the channel if you please, because it affected it for about half a mile in circumference around there.

Q. Now, if I were to say to you "Is there any channel of an old stream over here to the north?" or "Is there a channel of a creek out on the south side of the river?" you would understand very well what I mean by a channel?

A. Yes, sir. Oh, certainly.

Q. Now, I ask you if, giving the word the ordinary inter-

7832 pretation, you have ever seen or discovered anything that led you to believe there were any running streams or channels of water underneath the ground aside from that which works through the soil by percolation—faster in some soils than in others and slower in some others.

A. Oh, I am satisfied there is, yes, sir. For instance, right here in town when you dig a cellar, you can go up and see it now if you wish to, half or three-quarters of a mile east of Main street where there is an old distinct line of sand, and it is not wider than this room, much, and they grow trees, but they will not grow as luxuriantly as down here.

Q. That is an evidence that the river had an underground channel here at some time, is it not?

A. Well, undoubtedly there are underground channels as well as above ground. And then these little things confirm it, in my mind.

Q. But these little channels are filled with sand or something—they are not open channels?

A. Oh, no, I don't mean they are wide open streams like a sewer pipe.

Q. Well, you know there are such things as underground streams actually flowing, do you not, for instance in Kentucky?

A. Oh, yes.

Q. You never knew anything of that kind where the water ran in any definite stream underneath the ground in this part of the country, did you?

A. Well, only these evidences I have known of. I have never seen any underground streams, and never happened to tap
7833 any.

Q. And never knew of anybody else tapping any, have you?

A. No. When I speak of an underground channel I mean it may be filled with coarse gravel or boulders, where it would flow more freely than through coarse sand.

I have an idea that in the early time the river ran across this valley in different places from where it is running now. I judge that to be the fact. The river hasn't cut out much in my time, but it has the tendency of a shifting river.

Redirect examination.

By Mr. ASHBAUGH:

As to whether there is any evidence in the memory of white men since the earliest settlers that the river channel has visibly changed in the State of Kansas, entirely abandoning one place and washing out a different channel, I will say no, I don't know of any distinct channel of any length that has washed out since I have known the country.

7835 JOSEPH S. GEORGE, Hutchinson, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live at Hutchinson, Kansas, and have lived in Reno county, with the exception of one year—from the fall of 1882 to the fall of 1883—for thirty-one years. I came here in January, 1874, and have lived here, with that one exception, continuously ever since.

I am a wholesale grocer. I am secretary and manager of
7836 the Hutchinson Wholesale Grocery Company. As to how extensively I have done business over this part of the State of Kansas, I will say, well, our firm has done business from Newton west to the State line, south of the Union Pacific. Personally, I have been on the trains the whole length of the Arkansas river, as far as that is concerned. I have stopped at many stations as far west as the State line and know something by casual observa-

tion of the western part. But of this portion in through here, from ten miles west to eight or ten miles southeast, I am very conversant with it, and with its character and conditions during that time up to a few years ago. I used to do a great deal of hunting on
the river, and in that way became conversant with its gen-
7837 eral character. Yes, sir, hunting is one of my regular recreations.

As to the Arkansas river above and below Hutchinson as it flowed for the first ten or fifteen or twenty years I know it, I will say, yes, sir, during the first ten years of my life here I did more hunting on the river than I did after that. It was largely to the southeast, down the river. Occasionally I took excursions northwest or up the river. At that time during the existence of that old wooden bridge across the Arkansas river the channel to the southeast was, from the old bridge, practically clear of islands for a number of miles. There were a few very small ones which used to be our locating points to get out on and put out our decoys, but they were very far between in those days. I think in some portions of the river bed since that time, from what I can recall, the channel has narrowed somewhat by filling up at the edges. It appears so to me. But in looking down the river from the old bridge, which was practically upon the site of the present one, I recall in the early days it was a barren stretch of sand or water, as the case might be, whether the river was up or low, and I recall seeing the river bed then practically covered with geese and ducks a number
of times as far as I could see and the bend of the river shut
7838 off the view. During that time we had to go down the river about six miles before we came to any islands to speak of. Then there were one or two small ones in there that we used to locate our decoys from. Beyond that as far as we could see the river it was all about the same general formation. Up the river it was much the same until we got up some six or seven or eight miles, and I believe there was a little cluster of islands in there. That is about all I can say in regard to that during those years.

Examining Complainant's Exhibit A–55½, I will say, I think I recognize that as a picture of the river. As to what stage of water it was when that picture was taken, I will say, well, now, we would call that here, I think, fairly high water. As to whether it would be extremely high water (objection), I would say, nothing further
than I would call it fairly high water.
7839 Examining Complainant's Exhibit A–56, I would state that I recognize it as the old wooden bridge at Hutchinson. As to the stage of water when that was taken, well, we would call it at that time channel full, or medium.

As to any changes I have noticed along the river since those early days, I will say the greatest change I have noticed is within a mile, perhaps, or two miles of the bridge, southeast or down stream, where it was formerly practically clear of islands but where is now a network of islands for quite a distance, and from my observation that condi-

tion extends more or less all the way where I have had occasion to be close enough to the river to note it carefully. Yes, sir, I have
7840 noticed the condition of the river from the Missouri Pacific Railroad bridge a mile south of Hutchinson. There the old channel of the river is cut up by islands and there is probably now half a dozen small channels meandering around through them where formerly it was one clear sweep of water. As to how long it has been since I have noticed this change taking place and becoming perceptible (objection), it would be very difficult for me to say the year exactly, but I have noticed it more particularly beginning fifteen or twenty years ago. But the growth of islands has increased very rapidly during the last ten or twelve years. As to when I noticed the islands beginning to grow over with trees and the growth of trees becoming marked, I think that would be within the last ten years, in this section.

As to how the flow of the river, excluding flood periods, for the last ten years compares with any ten years in my early recollection (objection), well, I feel satisfied that there was more water
7841 ordinarily in the channel in the early years, according to my knowledge of it, than there has been for some years back.

As to how the carrying capacity of the river during the last ten or twelve years compares with the carrying capacity during the early years, the river being at the same height as measured by the banks (objection), well of course that is a question that is capable of close demonstration. It would be merely an opinion with me. My opinion — that would be that since the growth of those islands and their being covered with verdure and trees the carrying capacity of the river has been cut down one-half. As to whether the water level under the bottom lands has changed or not in the last few years (objection), I wouldn't like to say that I know because I have no occasion to dig wells or keep a careful comparative record of those things.

7242 Mr. DAWSON: There having been no testimony brought out from the witness which can be properly classed as rebuttal, Colorado declines the privilege of cross examination.

7843 CHARLES COLLINS, Hutchinson, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live at Hutchinson, Kansas. As to how long I have lived in Reno county, I don't know exactly, but our ranch was in Rice county when I first settled in this country, and on the reorganization my ranch was put in Reno county. That was about 1871. I settled there in 1870. Yes, sir, I have lived in Rice and Reno counties ever since 1870. In the early years my business was handling Texas cattle, and I have been handling Texas cattle about thirty-

five years. I am still in that business to a certain extent. Yes, sir, I own lands located about five miles north of Hutchinson, and have owned other lands in different counties during the time I have
7844 been here. Yes, sir, I have been acquainted with the Arkansas river during the thirty-five years, and I had known the Arkansas river a long time before that. I have known the Arkansas river pretty well since 1865. I first saw the Arkansas river at Fort Zarah, east of Great Bend, near the mouth of the Walnut. That was in 1865, and I have known it from there at least to Wichita ever since, yes, sir, and have been up and down it and across it a great many times.

As to what changes I have noticed along the Arkansas river since the early days, well, I notice that the water has been dropping in the ground along the river. It is not so high in the ground
7845 as it used to be in those early days. (Objection.) As to the change in the appearance of the river, well, there are a great many islands in it now, more than in those days, and the islands are larger. They used to be very small and now they are very large and more of them, and they are a great deal larger—most of them three times as large. The banks have been narrowing up to a certain extent all the time, and there is more timber grown on those islands, and as the water in the river dropped away the islands got larger and the channels filled up. They got bigger all the time and trees grew up, and grass.

As to how the carrying capacity of the river at the present time would compare with the carrying capacity in the earlier years, the water being at the same height (objection), well, it appears to me that the capacity of the river—that there is one-third of it gone as compared with what it used to be along in the early '70's, by filling in from the sides and the enlargement of those islands.

7846 As to how the flow of the river for the last ten or twelve years compares with the flow for the first years, or a series of ten years prior to 1890, exclusive of floods (objection), well, the flow has been diminishing since 1892 a great deal until during the last three years it has kind of come up again.

Yes, I spoke about the level of the water underground back from the river having lowered. Describing it more definitely (objection), I will say, well, when this town was first laid out, when they began to dig holes around where the buildings are now, the water was within about four feet of the top of the ground and now it is about seven feet, I think. I think that condition goes back just as far as the water can get through the sand. It at least goes back to the sandhills, five miles back; and as to the south, it would go back until it got to hard ground where it couldn't penetrate very much.

7847 Yes, sir, I am familiar with some lakes or pools that in the early days had water in them constantly and have changed since that time. Well, here is Brandy lake located down here ten or twelve miles east of here that used to have considerable water in it. It used to be quite a lake, and there have been quite a good

many fish in it, and I think some six or eight years ago it began to dry up and those fish began to die in it. I think that lake was fed from the river entirely. Of course the surface water that fell around it—the rain—put some water in it, but the principal thing that kept it up was the Arkansas river. As to whether the amount of water in the lake responded to the amount of water in the river, yes, sir, when the river was high there was plenty of water in the lake and when the river was low that lake began to diminish. As to other lakes or
7858 pools in the same condition, I have a fish pond on my place right due north of here in the bottom, right at the foothills, and the water dried up about six or seven years ago. I put some fish in it and it had a pretty good stage of water in it then. It is on the west side of the quarter, near the southwest corner of the quarter, and then there were some springs on the east side of the quarter, and I dug a ditch from those springs to this pond, expecting to feed it from the springs, and I did feed it and filled it up with water, but the river got low that year. I don't remember just what year it was then; about six or seven years ago. The river got low and the pond dried up. The springs were not able to feed it when it went from the bottom. I went to examine it and concluded it was going away from the bottom and if the river was extremely low the springs wouldn't feed it. Now, for the last two years the river has been up tolerably well again and that is full again. It is full of water now—running over. As to what connection I ever noticed between those springs and the Arkansas river, well, sir, those springs always run regardless of the river. They come down from the edge of the hills and they always run in dry weather. They ran in 1874 when there was no rain there for six or seven months. It was drouthy and the springs ran all the time. As to whether those springs ran stronger when the river has been up for any length of time and weaker
7859 when the river has been down, I would say, oh, yes, it would run stronger if the river would stay up for two or three weeks or such a matter.

As to whether the cellars in the city of Hutchinson respond to the condition of the water in the river, I will answer, oh, yes, all the time. As to why that is, well, as the river gets extremely low the cellars dry out and when the river remains up or full for a time they fill up again.

Cross-examination.

By Mr. DAWSON:

Q. Do you know whether the cellars in the town have water in them now or not?

A. I don't know. I haven't seen any of them lately.

Q. There has been a pretty good flow of water in the river, taking it on the average, for the last ten months, has there not?

A. Yes, there has been the largest flow in the river at this season

of the year—well, it commenced here in April, something I
7860 never knew before, and it has been up ever since. It commences about June generally.

This Brandy lake I spoke of is five or six miles back from the river, east. Cow creek doesn't run between it and the river. Cow creek empties into the river about five miles below, and Brandy lake is about twelve miles from here, somewhere in that neighborhood. The lake has no surface inlet or outlet. It is simply standing water, in a country very level and flat. In the early days it nearly always had water. In those days the country surrounding it was covered with native sod; now there is much more of the surrounding country under cultivation than there was then.

This fish pond of mine is four and a half miles from Fourth
7861 avenue here, right due north, and Cow creek runs between it and the river. As to whether I made this pond artificially, I will say, well, there was a dent in the prairie there where that water stood a good deal, and that is where I made the pond. When I first knew it and found water generally standing there the country was still in its native condition of sod; now the country surrounding it is under cultivation pretty much. I don't know how much higher than the river this pond is. I am inclined to think there is not much difference. I never ran any levels to ascertain, but we have been figuring some on the levels a few years ago and I think there is not much difference between it and the river. Well, the Arkansas river is higher next to its banks all over this country close to the river. It is higher than it is back generally a little ways. There is a dent there at the foot on the hills which makes it lower than the general prairie from here out there.

Q. Have you been interested in this suit of Kansas vs. Colorado?

A. No, I have never taken any interest in it at all.

7862 Q. You are a citizen and land owner in this valley of the Arkansas river, are you not?

A. Oh, yes.

Q. Have you considered that the questions involved in the suit were of any importance to you one way or the other?

A. Well, no, not very much, except my fish pond there, that is all.

Redirect examination.

By Mr. ASHBAUGH:

As to what effect an ordinary rain has upon the water in those pools and ponds, I will say, oh, of course when there would come a good heavy rain it would help to fill them up quicker, naturally, those pools. They used to stand—back in the early days those pools up around the sand hills used to be full of water all the time pretty nearly, and they have had no water in them for several years until the last couple of years.

In speaking of the level of this fish pond, I was referring to the level straight south, and the river runs southeast, yes, sir. Of course if we would measure it on a diagonal course we would get it higher.

7863 The ground next to the hills would be higher. If you take a diagonal course from here and go northwest you will rise faster than if you go due north. You would rise considerably faster. In going from the fish pond in a line that would strike the river at right angles, as to whether that point on the river would be higher than the fish pond, I should say, oh, I think it would.

Recross-examination.

By Mr. DAWSON:

Q. You never ran any levels, however, to determine that fact?
A. No, excepting the surveyors here all say that there is not much difference between the foothills five miles from here and the banks of the river on a straight north course.

7864 GEORGE W. WATSON, Hutchinson, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live at Kinsley, Edwards county, Kansas, and have lived in Kansas since 1867 and in Edwards county since 1890. I have been in the real estate business, and am now postmaster at Kinsley. I was formerly in charge of a land investment company, extending in its operations from Pawnee county to the west line of the State, taking the southwestern thirty counties of the State. Yes, sir, I have been giving my attention to farming and raising alfalfa and wheat. Yes, sir, I was giving my attention to farming in the Arkansas valley. We had 4,000 acres of alfalfa there. As to

7865 having given special attention to the condition of the underflow, I will say, yes, sir, I have made a thorough test to see whether there was an underflow, at one time. I sank wells and operated those wells for that purpose. As to what changes I have noticed in the river since 1890 (objection), I will say, having had lands all along the Arkansas river extending from the west line of the State to the east line of Pawnee county, we had quite a number of places that touched on the river. At some places along the river banks there would be cutting into the banks and at other places there would be accretions by reason of little willows and cottonwoods growing out, and that kept building out into the river, and also the islands in the same way. My theory is that the actual flow of the channel of the river in a good many places has narrowed up

7866 considerably within the last fifteen years or since I have known the river, and along where I have had reason to notice it the islands have been increasing in size. I know that on some of our own lands where the channel between a piece of

our land and the island would fill in the island would become a part of the adjoining land. We have had a few cases like that. There has been a constant growth of cottonwoods and willows along on most of the islands where I have known it, only they would sometimes cut under an island or a little point and cut off a point of it. But in general they have increased in size. Sometimes one of those floods will come down and it will get started digging into a place and will dig there into the bank of the river or into the islands.

As to the carrying capacity of the river today as compared with its carrying capacity when I knew it first (objection), I will
7867 say, the carrying capacity of the river has materially decreased. As to how far up and down from Kinsley this condition exists, I would say it extends all the way from Kinsley to the west line of the State, so far as I know. I am not so well acquainted with the west line, that is, the west counties, as I was when I was working out there. That was six years ago. Take it at Kinsley, I can illustrate by a bridge that we have across the river at Kinsley, what we call the new bridge, and also the old bridge. We have two bridges across the river there. At both of those bridges there have been sandbars formed and now covered with trees that were not there when I came there, and the consequence is that each and every year in the last two or three years we have had trouble with our bridges in high floods that we did not have before narrowing up there and making the water deeper right where it passed under the bridges. I crossed the river in coming from Kinsley to Hutch-
7868 inson this morning. One reason why I have noticed it at the bridges is that I am in the telephone business, and on both sides of those bridges we have our telephone connection and have had for several years and are troubled more lately by having our wires cut loose and having the bridges get washed out than we were before.

As to how the flow of the river during the last ten years compares with the average flow for the first ten years (objection), I will say, that is one of the problems that are pretty hard to answer. For the first two years we had, you might say, nearly constant water. There has only been a short time at any time within the last two years but what there has been some water passing by Kinsley. Before that for five years there was a good share of the time there was no water. There would be months at a time we didn't have a drop of water flowing at Kinsley.

7869 As to the underflow and my observations and experiments with it, and as to how far back from the river it extends (objection), I will say about ten years ago we had a big alfalfa ranch up the river and we put down a test well for the purpose of testing the underflow question, making a thorough test of it. We put down a three-foot pipe twelve feet into the water. It was an old smoke stack punched full of holes, the lower four feet of it. We put on a centrifugal pump there throwing 100,000 gallons an hour, and put on a steam engine to run it for a week or ten days, day and night,

simply to test the question as to whether there was an underflow.

7870 This well was about a mile from the river. We could pump that well down for ten feet in a very few minutes after letting it fill up. Then the other two we couldn't pump out, running that with all the power we could put onto it, throwing out water at full capacity all the time. It rushed in from the sides so rapidly through all those holes. That is the way we determined the question of whether there was an underflow or not, and we determined in our own minds that there was an underflow. As to the rise and fall, this well would rise—well, say for instance at a time of flood water in the river—at the time we put this well down there was no water in the river whatever, that is, when we got down the twelve feet, only possibly a small running stream. At the time we put the well down we got into the water twelve feet. Now if the river would fill that well would rise from one to two feet, according to how full the river was. If the river got bank full there would probably be from a foot to a foot and a half rise in this well. That was nearly a mile from the river. As the river would go down the water would recede in this well. There is a city well at Kinsley, and I noticed that, and my own well in Kinsley, I noticed that this spring on the big rise. The big rise came down

7871 first in May, I think, this year. Yes, our first big rise was in May, when it washed out two bents of our bridge in the early part of May or last part of April. My well rose there in Kinsley a little over a foot. The city well rose about the same. It is still farther back from the river than my well is, and I am nearly a mile from the river. The city well is fully a mile from the river, that is, taking a straight line from the river back I should say it was nearly a mile from the river. No, sir, those fluctuations of the water in these wells are never affected at all by rains. As to how far back the Arkansas river affects the underflow (objection), I will say from my experience and observation I know absolutely that it is affected for a mile back from the river in the valley.

Cross-examination.

By Mr. DAWSON:

7872 As to how I obtained the name of "Colonel Underflow," I will say it was started as a joke at Topeka. I had been advocating the underflow, and had been advocating it not only in Kansas but in Washington, and I had been trying to get the Government to take hold of the proposition by putting in a siphon plant out here as an experiment. A few years ago when the irrigation question was being agitated before the legislature in Kansas, I went up there and tried to get them to divert a part of the appropriation they were trying to get through for the purpose of putting in a little siphon plant or a six-inch pipe extending far enough down the river just simply to see whether from a three-foot well—this well I mentioned in my former testimony—we could make that

flow a full six inches of water all the time from that little three-foot well. They finally made an appropriation of $30,000 and appointed three irrigation commissioners and they spent the $30,000 putting in wells on the table lands and pumps run by windmills—something that we all knew could be done and had been done for years as far as that was concerned. But I was unable to get them to make the test as to the underflow. No, sir, I was not in the legislature.

7873 Yes, sir, I think irrigation would be of advantage to all of the country in Kansas lying west of Kinsley. Yes, sir, that is why they were trying to develop this that I call the underflow. Yes, sir, irrigation either from the underflow or from water taken directly from the river would be of advantage to the people of western Kansas. It certainly would. If the purpose of the bill

7874 of complaint in this case is and if the prayer of the bill asks that the taking of the water from the Arkansas river be enjoined and that the waters of the stream be allowed to run into and through the State of Kansas (objection), and if a judgment in accordance with that should result in the prohibition of the diversion of water from the river in Kansas at all, as to whether that would or not in my judgment be a benefit to the citizens of the State of Kansas along the Arkansas river west of Kinsley in this State, I would say this (objection), that the taking of the water out of the river and the using of it for irrigation purposes in my estimation is a benefit to any part of western Kansas extending from Kinsley west or even from Hutchinson west. I will say further that I believe it is a benefit to the farmers who do not use the water directly on their own lands, in that by spreading it over the surface of the ground there is a great deal more evaporation and consequently more rainfall and more dew than if the water was left in the channel and simply flowed down the river.

7875 As to whether I believe that the irrigation of two or three hundred thousand acres of land along the Arkansas river in Colorado has had any influence upon the climate, the rainfall or the distribution of the rainfall in western Kansas (objection), I would say that I believe it has a tendency to create humidity in the atmosphere and that if we had the same amount of water in western Kansas or enough water to keep our ditches going there the humidity would be increased by reason of the two States taking the water out and using it, but not overdoing it in either State.

As to whether in my judgment the underflow or what you designate in Colorado as the ground water is present in sufficient quantities in the valley of the Arkansas river in western Kansas at the present time and of late years so that if properly developed it could and would furnish large quantities of water for irrigation, I

7876 would say, there is no question about it at all. As to whether it is a fact, whether the river be dry or not, that there is always in the ground in the valley of the Arkansas river large quantities of water which can be reached by sinking for them, I will say,

there is always a large supply of water. Of course when the river is dry it is lower down. As to how much of a variation my observations have led me to believe exists between the level of the ground water when the river is practically dry at Kinsley and when it is running an average or ordinarily full stream, I will say, well, from one to two feet, about. But the general level of the water is lower now than it was away back in 1890. As to whether it is partially from the fact that the general level of all water subsides as the country becomes fully settled and farmed, I couldn't answer that at all. I don't think that would apply to any country only a timbered country, where it was cleared out. As to whether in the early days there was a greater run-off from rainfall into the river through the State of Kansas because of the fact that the country was then in sod and is now largely under the plow, and more waters are absorbed, I would say I should judge to a certain extent there was a greater run-off, but how much that affected the flow, I couldn't tell, of course. Yes, sir, that part of the State of Kansas lying west of Kinsley or even west of Hutchinson shows a change as to its
7877 production of crops or the certainty of crops in the last ten or twelve or fifteen years, and as to what I attribute that change to, I would say I attribute it to the increased number of acres now under cultivation, for one thing, causing an increased amount of water that is evaporated and not run off at all, and an increased humidity in the atmosphere and consequently an increased average rainfall—although the statistics might not bear me out in that, but there is an increased amount of moisture. Yes, sir, it is my claim that whether the statistics would show an increase in the total precipitation or not the rains are better distributed for crop production, come in a gentler and better form and that there is more humidity in the atmosphere and that the rains come in a better average
7878 time. As to whether it is a fact that the country lying west of Hutchinson along the valley of the Arkansas river from that point to the Colorado State line is more productive now and has been on the whole for the last seven or eight years than it was in the earlier period (objection), I will say, I will draw the line at Dodge City. From a line running north and south from
7879 Dodge City and east of that we feel that we are more certain of crops now then we were ten, twelve or fifteen years ago. West of that I can hardly say that there has been any improvement in that respect. No, that is not because I have not full information. I have full information to the State line. I am keeping track of that very closely. Yes, sir, I am aware that the people at Garden City claim that their crops are much surer there during the last few years than formerly. That is true. But whether it is simply by reason of an extraordinary amount of rainfall in the last two years or from any other cause, I am unable to say.

As to whether it is a fact that from the first time I became acquainted with this country and the Arkansas river there have been cycles or periods of years when the river for a number of years

would flow a better stream than it would for any other given
7880 number of years or any other cycle, I would say, I would hardly feel like being able to answer that. I know we have worked up and down that river since 1890 clear to the Colorado line, and we have always considered that after the June rise we would have a dry river from that until fall and sometimes all winter. Of course there would be periods when there would be a rise, but I don't know that it would come in cycles. I hardly think it is true that, taking it from the time when I first knew the river, we would get periods of say six or seven years when the flow of the river would be better for that cycle of years than it would be for another six or seven years. I think the flow has been decreasing rather than increasing until the last two or three years. Yes, it might be that, and still what you suggest might be true, but that has not been my observation at all.

7881 My first experience with the Arkansas river was in 1890. I came to Kansas in 1867, but came to this part of the State in 1890, and at the latter time I became acquainted with the river. As to which would work the greater injury, in my judgment, from my knowledge of the country and the citizens of the State of Kansas—the establishment of a doctrine which would prevent anybody withdrawing water from the river for irrigation purposes or the establishment of a doctrine which permitted everybody, both in Kansas and Colorado, to draw on the river for irrigation in accordance with their priorities—I would say (objection), before answering that question I would have to know what their "priority" means. I would have to know what the word priority means there. If it means that the entire capacity of the river has been taken by Colorado, and that under that claim they could take the entire
7882 flow of the river, both normal and abnormal, I believe it would be a benefit for them to be prohibited from taking any; but if it means that there would be a fair division of the natural and abnormal flow of the river coming into Kansas and being used in Colorado as well as in Kansas for irrigation, it would be beneficial to both Kansas and Colorado and not detrimental; that the benefit would be greater to the entire State of Kansas by reason of that irrigation and the use of the water for irrigating purposes than it would be detrimental to the balance of the State by simply letting the water flow down the Arkansas river. Now, that is as well as I can answer that question.

Yes, sir, I have some general knowledge that ditches were constructed in western Kansas quite a number of years ago. As to whether if the doctrine were established that the waters of a stream could not be taken for irrigation, and that doctrine were enforced, neither Kansas nor Colorado could take the water for irriga-
7883 tion (objection), I would say no. The enforcement of such a doctrine could not result in anything else only to have them flow through the State; and in view of that, whether, in my judgment it would be of greater advantage to the State of Kansas to

have the doctrine of appropriation and use for irrigation established under the theory that there should be a fair settlement as to appropriations and prior use between the citizens of Kansas and Colorado, or whether it would be of greater advantage to have the doctrine established that nobody could take water for irrigation out of the stream, I would say (objection), if there could be a fair division of both the natural flow and the abnormal flow of the Arkansas river so that Kansas would get her fair proportion of the water for irrigation purposes, it would be more beneficial to Kansas to have it used in that way than it would be to have it go down the river
7884 without being used by either State. I mean by a fair division (objection), that in my estimation at least one-half of the natural flow of the Arkansas river from the mountains east should be allowed to go into Kansas. In accordance with this answer, as to how Colorado is going to get the advantage of the water which originates in Kansas and runs into the river (objection), if Kansas is to have one-half of the water originating in Colorado, regardless of who first applied the water to a beneficial use (objection), in answer to that I will simply say, I am for Kansas.

Redirect examination.

By Mr. ASHBAUGH:

7885 If the flood waters of the Arkansas river could all be impounded in reservoirs in Colorado or in western Kansas and those flood water- be used for irrigation in Kansas or Colorado according to their priorities as determined by the court and the normal flow of the river remain undisturbed, as to what effect that would have upon the Arkansas valley in Kansas (objection), I will say that in my estimation if all the flood waters could be impounded in Colorado and western Kansas it would supply more irrigation than we now have from all the ditches that we have and the normal flow coming into Kansas would benefit Kansas as far as the Arkansas river runs through Kansas.

Recross-examination.

By Mr. DAWSON:

Yes, sir, I am aware of the fact that there are very great difficulties in capturing the real floods. They tear out the headgates and destroy ditches and raise trouble generally when they
7886 come, yes, sir. There is always some trouble in that way, but it is not so great but what it could be overcome with plenty of capital, I think.

WICHITA, KANSAS, June 10–13, 1905.

7887 (Complainant's Exhibit A–5½ introduced in evidence, to be considered in connection with Complainant's Exhibit A–5, being the record from the United States Geological Survey of the flow of the Arkansas river for the year 1904. Objection.)

JESSE J. TODD, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

7888 I live in Wichita, Kansas, and am a photographer.

Examining Complainant's Exhibit A–60, I will state that
7889 it is a photograph of the Arkansas river and the islands in the river, made by myself on the 16th day of May, 1905, at a point between sections 2 in Union township and 35 in Eagle township, range 2 west, in Sedgwick county, Kansas. That point is about sixteen or eighteen miles above Wichita on the Arkansas river. This is a correct picture of the Arkansas river as seen on that day. As to the stage of the Arkansas river at the time Exhibit A–60 was taken, I will say, during May 15th and 16th I have the record, and the gauge was about 7 to 7.4 feet. It was getting
7890 rather high then, and on that day I should judge was at a flood stage. It was what I would call high water. The gauge showed at the extreme height of that flood at about 9 feet, and this water was about 2 feet lower than the extreme height.

7891 Examining Complainan't Exhibit A–61, I will state that it is a photograph made immediately after the other one, of the Arkansas river, at the same place, and made by myself. It is a correct view of the Arkansas river as shown at that time. Exhibit A–60 is a view up the river from that point and A–61 is a view down the river from that point. As to the number of
7892 islands that are shown in these exhibits, I will say, there are five shown in Exhibit A–61. The two photographs show, I suppose, about a mile up the river and about the same distance down the river.

(Complainant's Exhibits A–60 and A–61 offered in evidence. Objection.)

Cross-examination.

By Mr. DAWSON:

Q. Mr. Todd, in answer to a question about Exhibit A–60 you asked leave to refer to a map which you had. Aside from the fact that you know you were located in a given place when you took Exhibit A–60 and aside from the further fact that you located that place on a map at the time, would you be able to tell simply by looking at Exhibit A–60 what part of the Arkansas river it shows or whether it shows the Arkansas river at all or not, you even being a photographer? That is, from the picture alone?

7893 A. I don't think I am familiar enough with the river to say that I could tell. If a number of scenes were presented to me and I was asked to pick out which one was the river, I couldn't.

(Objection to Exhibits A–60 and A–61.)

7894 J. R. MEAD, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in the city of Wichita. I brought my family here in 1868, but I have been doing business on the river since June, 1863. I have lived continuously in Wichita since 1868. I preëmpted 160 acres of land which is now in the heart of the city of Wichita. I preëmpted that claim in 1868 and received a patent from the United States Government. As near as I can speak approximately there were twenty or thirty claims preëmpted at that time in
7895 Wichita. The parties had taken the first steps towards such preëmption. Nearly every one of those claims were adjoining or touching the Big Arkansas river or the Little Arkansas river. Since I have been in Wichita as to my business, I have been farming, stock raising, fruit raising, grain raising, building, and almost everything that is necessary to do in a new country. I have been a member of the house of representatives and a member of the State senate. I was county commissioner of Butler county, Kansas. I am vice-president of the State historical society and a member of the State horticultural society. For more than twenty-five years I have been a member of the Kansas Academy of Science and have been its president, and I belong to a good many other minor asso-
7896 ciations of that kind. I have taken a great deal of interest in those various societies.

As to my being familiar with the history and development of the Arkansas valley, I will say, well, through my own observation and the information I get through those societies and through my associations with other people I have tried to inform myself on all these subjects. As to my having written to a certain extent for the benefit of these societies, I will say, yes, sir. Twelve years ago I wrote an article for the Kansas Academy of Science, which was published in the proceedings, entitled "A Dying River." That had reference to the Arkansas river, and in it I described the condition of the river at that time and as it had been since my earliest acquaintance with it, and its probable future. Yes, sir, I have that volume
7897 in my possession now. In 1863 I was engaged in the fur trade on the plains, and to some extent that took me up and down the river. It took me across it more frequently than up and down the river. I had occasion to cross it very frequently wherever we came to it. I crossed it then principally from a point about two miles south of where we are at the present time to the vicinity of Hutchinson. I had trading posts on both sides of the river—one at Cowskin Grove, on the Cowskin, and also had trains running to where Camp Supply is now and as far as the Wichita river in Oklahoma, and everywhere where the wild Indians were, almost. I traded principally with the Indians, and also with what few other

hunters and trappers there were on the plains, and with other traders. There were not any white people in Wichita or near
7898 here in 1863. Yes, sir, I was one of the first white men that settled here. In 1863 this was a buffalo range. There were no white people here whatever and no settlements here. There had been one white man settled on the river nine miles northwest of here and he was killed by the Indians that same fall and his family moved out, and the first settlement commenced here shortly after the survey in 1867—the first white man to drive a stake in the ground with a view of holding a piece of land. Before that we owned it all in common. Yes, sir, that was the United States Government survey of the land on both sides of the river, made in the summer and fall of 1867. On the east side of the river it was surveyed by Corielle and Bowles of Washington, D. C., and on the west side of the river by Colonel S. S. Smoot of Washington, D. C. We had our plans to locate a town at the mouth of the Little Ar-
7899 kansas river in 1868. We had a private postoffice kept here by G. S. Munger in 1869. The Government postoffice was located on the east side. There was nothing on the west side. The land I preempted is on the east side of the river, I presume half a mile from the river. It is between Douglas avenue and Central avenue.

As to the Arkansas river as I knew it in the early days, as to its width, its flow, its bed, etc., (objection), I will say as prelimi-
7900 nary that I had been engaged in the fur trade on the plains and in hunting prior to my coming to this locality, from 1859 to 1863, and was engaged on the plains in the same business, but north of the Arkansas river. I was familiar with the Solomon and Saline and Smoky Hill rivers north and their various tributaries for 150 miles west of the 6th principal meridian as it is now. The Indians got to killing us off too fast up there and I moved my business and affairs down to this locality. I first came onto the Arkansas river about six miles north of this present spot in June, 1863, and travelled along the river for some fifteen or twenty miles on the north bank of the river, crossing it at various places and times as suited my convenience. I found the river
7901 to vary very much—from about 800 feet in width to about 1600 feet in width. In the places where it was wide the water was of a uniform depth clear across the river, or very nearly uniform, varying from eight inches in the shallowest places to two feet in the deepest places, as I remember distinctly from fording it a number of times and also from following an elk that I had shot as he was half way across the river and getting on my pony and riding below and getting across and getting him and coming back again at that particular spot, and also by killing 16 buffaloes right on the bank of the river at the same place on the same day. Where the river was narrow it was a good deal deeper and we didn't attempt to ford it at those narrow places. We found a place where it was broad and

where the buffaloes in great herds passed back and forth, guaranteeing a solid bottom with no quicksand or anything. I continued in the business of hunting and employing men and in trading continuously from that time so long as the buffalo remained in the country, which was about until 1867; that is, in this vicinity. I had occasion to ford the river at all seasons of the year both winter and summer, and also a good many men and teams which I employed and which I kept in very close touch with, and frequently assisted them in crossing the river in times of difficulty, always riding
7902 across the river first on my horse to find if it was perfectly safe and to see that there were no deep holes scooped out in the meanwhile. In the summer of 1863 the river continued to flow quite a continuous stream until some time late in the fall or beginning of the winter when it went dry, entirely dry, excepting in deep holes which were full of fish and we caught a great many of them by making a net and sacking them. Then along some time after January there came, without any premonition, a flood down the river, bringing with it some ice, tumbling over and over as it came down, filling the river from bank to bank, somewhere from a foot to two feet deep, the front of this was about that deep. Where it came from was always a mystery to us, but it came. The river continued to flow then for the remainder of the winter and in the spring the usual spring rises came. It frequently occurred that the river was impassable in the early spring and summer months. At one time I saw a four-mule team and a heavy freight wagon swept away by the current and the mules drowned. That occurred right here in the present town site, just at the mouth of the Little river, where we had a ford. I afterwards brought a small ferry boat down there on which we crossed with wagons and teams—well, I swam my horses but took the wagons to pieces and tied them in the boat,
7903 and the loadings, etc., and with the assistance of the Indians we crossed a great many teams—not only my own teams but a great many other teams. I kept a man there with the boat. That was in 1865. It was frequently the case in the winter that the river was frozen over solid and we crossed on the ice from bank to bank with loaded teams—loaded with whatever we might have. On one occasion I came to the south bank of the Arkansas river about two miles above here at our regular crossing place in the latter part of the winter—probably the latter part of February. I found the river covered with a coat of rotten ice about eight inches thick from bank to bank, too rotten to bear our teams, and as we were out of provisions and it was all burned out clean on the south side and it was necessary for us to cross, I took my two men, one an Indian and the other a white man, and myself, and we went to work early in the morning and chopped a road clear across through, and shoved the ice under. The water was from knee deep to waist deep and we worked in that ice and water all day long and then in the evening I got my teams through the lane we had cut across the river and in 15 minutes after the ice moved down and shut that lane up. Our feet

were bleeding and cut with the ice. Our feet would get so
7904 cold with our boots on that we couldn't work. When it would get so cold we couldn't work any longer we would get up there and stand on the ice until our feet got warm. It was a thawing day. At another time I came to the south bank of the river from one of my long trips down on the North fork of the Canadian, with my teams and was caught in a blizzard on the south side of the river. The river was full of floating ice so that we couldn't ford. The water was from knee deep to waist deep from one bank to the other. It was so cold that on the second day I crossed I crossed my teams on the ice by stringing them out. I think that was the winter of 1866. I am not positive. In the summer of 1865 I had a trading post directly west of Wichita at Cowskin grove, about seven miles west or nearly west. I had a full-blooded Cherokee Indian named Dave Ballou trading for me. He collected for me, after the water got so high that we couldn't haul them across as we had been doing, 1500 buffalo hides—the dry skins of buffaloes stretched flat. We couldn't cross them on account of the high water. I swam the river on my horse numbers of times to go out there to try and keep the moths from eating them up, moving them to different
7905 places and beating them and putting them up on racks. Along toward the middle of the summer or a little later I succeeded in getting the running gears of the wagon across by men standing on the axles and others riding the horses, in the most favorable places we could find. I made a rack and hauled those hides down to the south bank of the river. The river continued so high that it was impossible to cross them. They lay on the bank of the river for a considerable length of time, two or three weeks probably, and we were camped there but unable to cross them. There was a band of about 25 Indians came along that I was acquainted with and they proposed to take them over for me and to help me out of my dilemma. So I built some rafts of dry cottonwood logs and I would pile these skins on the rafts and tie them on and the Indians would swim them across or take long ropes, lariats, and swim out to some shallow place and pull, and others would swim out and push them until finally they got them all across. My loss on that lot of hides on account of the damage by the moths, by my not being able to cross the river, amounted to a dollar apiece, so I lost $1,500.00 by the high water that summer. My recollection is that we crossed them along about the latter part of August and I took them down to Leavenworth, and
7906 don't recollect about the condition of the river for some time after that. That was in the year 1865. There were two occasions (objection), one in the late fall of 1863 and one in the year after that, which one I can't remember now, on which in the early winter the Big Arkansas river was entirely dry above the mouth of the Little Arkansas river, excepting in some deep holes. Prior to 1868 I had seen the river dry above the mouth of the Little river twice. As to the river during the summer season of those years and

of the other years, the water was high in the other years; in other words it was normal, the same as it usually was. By its being
7907 normal I mean there was not a great deal of variation in the habit of the river. We always expected high water in May and June and occasionally excessively high water from rains here in the State of Kansas within a hundred miles west. The river after the May and June floods were over gradually subsided until it came to a uniform flow of clear, pure water, which usually continued to the late fall, and in a majority of instances continuously all winter. As to how deep the normal flow of the river outside of floods was (objection), I will say the river at its normal condition, as we used to express it in those days, would be about knee-deep; and as to width, for two or three miles immediately below the city of Wichita it varied from 800 to 1,600 feet. There were some places it was not very wide excepting in times of flood when it spread out over the low lands adjoining, but which was not the usual sandy bed of the river. As to the channel of the river as to sandbars or islands as far up and down the river as I was acquainted
7908 with it, I will say that in the portion of the river extending up toward Hutchinson with which I was intimately acquainted there were very few islands in the river. The bed of the river was entirely composed of sand. At times of low water sandbars were sticking up almost anywhere in the river; there was occasionally a large, permanent island like the one at the mouth of the Little Arkansas river and another at the mouth of Chisholm creek, and some others up the river which had just simply a small, narrow channel on one side, but which were almost attached to one shore or the other, and a few of what we called tow-heads, little patches of what might be remnants of a little island where a sandbars had attempted to form an island but the water soon washed it away, from two or three rods square of earth to perhaps a quarter of a mile. There was occasionally one of that kind which would disappear in a short time. The island I am speaking of at the mouth of the Little river was first known as Lane's island, because he preempted it. At the present time it is known as the water works island, and the water works of the city of Wichita are located on that island. As to the other island I spoke of up the river,
7909 there was no name to that island until a colored man settled on the island and it was known by his name. This is Swan's island. There was no name given to the island down at the mouth of Chisholm creek until Mr. Lane occupied it or took possession of it. As to how many islands there were when the survey was made in 1867, I will say, from the present site of the city of Wichita there were two little tow-heads, one right where the Douglas Avenue bridge crosses and another a hundred yards below, near the east bank; and directly against the east bank of the river, which is now built over with business blocks, there was a deep channel running around a piece of ground, but this channel was not over a rod wide. At times of high water it was very wide and deep, and in times of low

water there was no running water there and it was possibly a part of the mainland. The next island above—well, I will say that where this large Ackerman island is now, comprising 20 or more acres of ground, there was nothing there but a sandbar, and no vegetation on it whatever, and it was only to be seen in low water; and
7910 then right opposite the mouth of the Little Arkansas river there was quite a large island there that probably comprised twenty or thirty acres, covered with a growth of old timber, showing it was an old and permanent island. Between that island and the north bank of the Arkansas river was a narrow channel three or four rods wide only, as I remember it now, which in time of very low water was dry, above where the Little river came out. The Little river apparently came right against the center of this island and then turned down around the end of it, and above where the Little river struck it was a narrow channel connecting with the Big river. Then the next island I remember of—thought there might have been little ones between, I don't recollect that because I have had no occasion to cross there—was this island on which the colored man settled, which is now a part of the mainland. From Swan's island up the river I have no recollection of any other islands. As to trees on these islands or along the banks (objection), I will say that as far up the Big Arkansas river as the vicinity of Mount Hope the
7911 river was lined usually but not always on both sides with a heavy fringe of large cottonwood timber, with occasional bends in the river which would be grown up solid with timber. In many places the fringe of timber was very narrow, just along the banks, or where the bank slopes down into the river. From the water's edge up to the bank those trees would be growing. They were large trees, two by four feet in diameter, and very old. The Little river was similar—a solid line of timber as far north as Sedgwick City. Occasionally there was a place where the level plain ran right up to the river to a perpendicular bank where there would be no timber or brush, usually on the north side, but on the south side there would be a line of timber.

Yes, sir, Lane's island was covered with large cottonwood trees at that time, and the island down at the mouth of Chisholm creek was covered with brush and timber, but not so large or uniform as the timber on Lane's island. As to how long that condition of the river continued, and as to changes in it, I will say (objection), why,
7912 in the last ten years after the first settlement of the country there was but little change excepting that I remember one or two summers in which the river was unusually low, in fact there was but a trifling amount of water in it for two summers at least in the ten years after the first settlement of the country. Yes, sir, that would be up to about 1880 or along there a year or two, more or less.

As to the first ferry established in the city of Wichita (objection), speaking from recollection, I think it was in the year 1870. My recollection is that the first bridge was built in the year 1872. I

was one of the parties that built it and paid for it. Yes, sir, that is the bridge that is shown in Complainant's Exhibit A–1. That bridge lasted about nine or ten years and then was replaced
7913 with an iron bridge, which is the present iron bridge. The present iron bridge was built at the same height as the old wooden bridge, and exactly at the same place. It was built on the same piers.

Examining Complainant's Exhibit A–1 (objection), I will say that is a fair representation of the river, with the exception that at some times the river was a great deal higher and some times it was lower. As to the stage of the water as shown in Complainant's Exhibit A–1, I should say that was the ordinary summer stage after the spring floods had subsided.

Examining Complainant's Exhibit A–2 (objection), I will say that is the iron bridge built in the year 1879, but the picture is taken at a higher stage of water than Exhibit A–1.

7914 Examining Complainant's Exhibit A–3, I will say that is the same iron bridge, but the water is considerably lower. As to whether Ackerman's island shows in either of these three pictures, I will say, the sandbar which was afterwards built up and became Ackerman's island shows in Exhibit- A–2 and A–3. As to whether Ackerman's island shows even as a sandbar in Exhibit A–1 (objection), I will say there is nothing that now comprises Ackerman's island that shows in Exhibit A–1. In the center of the river when we had that bridge there was a little tow-head on which there was one little lone cottonwood six inches in diameter. The
7915 little tow-head came right where the channel pier was put in, or the south end of it. It was perhaps two rods long and one rod wide, and there is apparently a little remnant of that showing in this picture or something there in the place where that little tow-head was. No, sir, there is nothing showing in Exhibit A–1 that finally developed into Ackerman's island. Ackerman's island, I will explain, started three or four hundred yards north of the bridge. It was a sandbar which I had noticed many times before the settlement of the country. In a good ordinary stage of water or high water it was not visible at all. In low water it was a sandbar. There was not a spear of grass nor a twig of cottonwood or willow growing on that sandbar until after the settlement of the country.

As to the changes that I have noticed along the Arkansas river in later years (objection), I will say, the river has been exceedingly erratic in its character since 1880. From about 1880 there was a great decline in the volume of water in the river, and in the last several years there apparently has been during the summer an unusual increase in the volume of water. Commencing with about 1880 the river ceased to flow with its usual volume of water. What were formerly sandbars commenced growing over with cottonwood sprouts and would make a considerable growth the first season, perhaps four feet high. The next high water that came would make a deposit of sand perhaps a foot deep among those cottonwoods. They

would continue to grow. They became very numerous in the river and in the course of a few years those sandbars would gradually develop into a timbered island, which in very numerous instances at the present time are as high and covered with timber equal to the adjoining banks of the river, or very near it. As to
7916 the changes I have noticed in the last ten or twelve years in the width of the river (objection), I will say I know of one very forcible illustration of that narrowing of the river. South of the city of Wichita, on Hydraulic avenue, about four miles south of Douglas avenue, where the river runs nearly east and west, in 1872 I owned a tract of
7917 land fronting on the river of about 350 acres. I had men employed there in the winter cutting the fallen timber or timber that had been previously cut into cord wood and stove wood, etc. The river at that time was about 1,600 feet in width, and I know of subsequently building a bridge across the river there which was 1,600 feet in length, which I remember and which I helped pay for. At the present time the current of the river there is not over 400 feet wide. The balance is timber—cottonwoods and willows. It is farm land. In that particular locality the river since my recollection has narrowed up from 1,600 feet to probably 400 feet. My general knowledge is that the river has narrowed up almost universally. I have not paid particular attention to other places as much as to the locality which I have mentioned, but instead of narrowing there have islands built up in the river which take up perhaps half and in some places two-thirds of the channel of the river which the original banks remain as they were.

7918 Yes, sir, I am familiar with the place where the Lawrence Avenue bridge crosses the river south of the city. There is an island immediately under the middle of that bridge. As near as I can remember, that island has been there about fifteen years, and is now all grown over with cottonwood and willow trees. As to the proportion of the river channel which that island occupies, while I have crossed the bridge many times in all these years and within the last few years or months, I have not noticed that; but perhaps one-fourth. As to whether it occupies very much more than one-fourth (objection), I will say there is quite a considerable island there, but I can't tell you, because I haven't paid attention to it.

As to how the carrying capacity of the river for the last three or five years would compare with the carrying capacity during the earlier years, the water being at the same height as measured by the banks (objection), I would say in the locality I have men-
7919 tioned on Hydraulic avenue the capacity of the river has been reduced three-fourths, and as to how it is up and down the river so far as I know it, I will say that at Ackerman's island here in the city the capacity of the river is probably reduced three-fourths. As to how far the Douglas Avenue bridge is from the upper point of Ackerman's island, I would say it is less than half

a mile, I think. I can't tell you exactly, but half a mile approximately.

As to the average flow of the river, exclusive of floods, for the ten years last passed compared with the average flow, exclusive
7920 of floods in the earlier years (objection), I will say I think, excluding floods, of which we have had several notable ones lately, the volume of the river has decreased one-half.

As to the Little Arkansas River and its flow and width and depth (objection), the Little Arkansas river in its original condition before it had been touched by white men was a stream of pure, clear spring water, occasionally running over gravelly ripples, where we forded it in different places. It would be perhaps two rods wide and six inches deep at the time when it was not influenced by rains. It ran continuously across the ripples about two rods wide and six inches deep for five or six miles above Douglas avenue in the city of Wichita. As to whether the bed of the Little Arkansas river is lower than the bed of the Arkansas river at corresponding points, I will say, I never have made the measurements myself. I have been told by engineers that it was.

7921 As to the underflow in this country, I have the same general knowledge that the people generally have. As to the slope of the land in the city of Wichita and as to which way
7922 the flood of 1904 went down through the city of Wichita (objection),—I will saw, first, in reference to the time of taking the complainant's — last August, I was in Chicago and in St. Louis at the World's Fair and was not in Kansas at the time of taking that testimony. Answering now your previous question, I will say (objection) that the slope of the valley is about eight feet to the mile and that the valley here runs in a southeasterly direction. The underflow water runs in a southeasterly direction, or east of south.

(Objection.) The flood water in the city of Wichita in 1904
7923 ran directly nearly north and south in a southerly direction through the city. It gradually worked in a southeasterly direction as it got farther down through the city. As to how far back from the river I have noticed the underflow (objection), I will say I have seen drive wells put down and have put them down myself so far as the bottom lands exend on either side of the river. In some places it would be four miles on one side and none whatever on the other, as occurs five miles south of the city, where the river strikes the eastern bluff, and on the other side it is five miles wide. Where the city of Wichita is built the underflow extends to the high land—to my knowledge, to the high land on the other side of what we call the Big Slough, probably four miles or perhaps more. On the east side it extends, to my knowledge, on Douglas avenue and Central avenue, a mile and a half; or perhaps farther, but I don't know that of my own knowledge. As to what my knowledge and observation have
7924 been (objection), I will say I have owned and still own numerous tracts of land on both sides of the Arkansas river, farms, whole additions to the city, city blocks and individual lots. On a

great many of these I have had occasion to put down drive wells On one tract of land lying west of the river I put down ten or fifteen drive wells on one 80 acres. I have driven wells on my farm six miles south of the city and south of the Arkansas river at the present time. On other farms which I have owned in that vicinity and adjoining it I have had occasion to put down drive wells in numerous positions or localities as it suited our convenience. We would build a cattle pen in a certain place and go and put a drive well down there and next winter move it to another locality and put a drive
7925 well down there. I have gone down there alone with a drive well and a heavy cast iron hammer and a spade and put a well down myself on my farm and watered rows of trees which I had set out. I did it all myself on the same day. I put the well down myself within an hour and would go to pumping water, and moved it to another locality on the same farm, as suited my convenience. As to how we could tell when we struck the water level, I would say, the pipe would go down so easily after you struck the sand that you could drive it six inches with one blow of the hammer, while through the soil above it was quite a slow process sometimes, depending on the nature of the soil. We never had the slightest difficulty in knowing when we struck the water. Whenever we struck the sand we invariably struck the water. As to open wells so that we could see the water in them, I will say I have had holes down to water, but never dug a well. My first object
7926 lesson was in digging a cistern in my original home here in the city. That home was on the corner of Central and Lawrence and Topeka avenues. It occupied a whole square there. I dug down there about six and a half feet, as I recall, and I came into sand, and the water came in so fast that I had to fill it up six or eight inches. That was in 1873 or 1874. It was not in the winter. Otherwise I don't remember the time of the year. Yes, sir, we found the water at six and a half feet. At the present time I live half a mile right directly east of that place. Yes, sir, I know the depth to water at my present home. I dug a well, not for the purpose of obtaining water but for the waste pipe for my kitchen, before
7927 there was any sewer system there. I dug down eight feet and came to living water in the quicksand. At that season of the year in which I dug it was eight feet to water. I found pure living water there that would have answered the purpose of a well by digging it a little deeper. Yes, sir, that was at a different season of the year. At the time of our flood last year (1904) the water rose in that well to the top of it. It came from beneath until it was full, and later the flood came and covered the top of it. As to whether the water in these wells rises and falls according to the condition of the water in the river (objection), I will say as to that particular hole I couldn't tell you, because, as I say, we used it for a drain pipe and only once in a year we would pump it out and run it away off the premises. But as to the other
7928 holes and cellars and wells I can answer, yes, sir. I have a

basement under my house, and at the time this river is bank full and the Little river is bank full and Chisholm creek is bank full the water has on several occasions risen in my cellar from an inch to three feet deep, without any water coming in from the surface, as it is well protected and slopes from the house in every direction. No, sir, I don't notice that when the Little river rises from a rain. A sudden and quick rise in any of these rivers would not affect that basement of my house at all. When all of these rivers are bank full and continue bank full for a period of two or three weeks, perhaps, then the water comes up. That condition extends all over the city of Wichita, as I know from the fact that I own some buildings right here on Market street in the first block north of Douglas which have basements under them 120 feet in length and each one of them the width of the lot and whenever the streams of the rivers are bank full here for some length of time the water will rise in those
7929 basements from one ro two inches to a foot deep, and possibly they have risen eighteen inches deep there on one or two occasions. As to that being true on the west side of the river or in west Wichita, I can't speak from my own knowledge. I have no buildings over there and never dug any cellar over there. As to my observation of cellars on the west side, I will say, in what is known as the Princess addition we had until recently a ten-room house which we built with two separate cellars under it. It was a double house. And in times when the rivers and streams were bank full for a considerable length of time and the whole country was pretty thoroughly soaked with water the water rose in those cellars a foot deep. As to what effect the Arkansas river has upon the cellars in the city of Wichita when the river becomes full and remains full for some time although there is no rain (objection), I will
7930 say that is a pretty hard question to answer, for the reason that almost invariably when we have a great big river, bank full, it is accompanied by very heavy rains all through this section of the country. But I have known of instances where there was no unusually heavy rains here but the Big river and the Little river were bank full for some time and the water rose in this market street building here, for instance, There were very few cellars built here in the early days in the principal part of the city. The facts about it are that the early buildings built in the city of Wichita were of a temporary nature. They didn't usually go to the trouble of digging cellars or doing anything more than simply what was necessary to put up a temporary, cheap building. They began to change and built more permanent buildings after ten years, probably, after the first settlement here—the first founding of the city. Some of the buildings then had cellars under them. Not generally, but occasionally. As to whether or not in the later years we can dig a cellar deeper in the city of Wichita than we could in the early years, so far as its being affected by water is concerned (ob-
7931 jection), I can only give an opinion, and that is that with the exception of floods, which we have occasionally, the level of

the water underneath is usually lower than it was in the early days; but I want to say here in connection with my digging that cistern at my big residence here on the corner of Central and Lawrence, I also put a basement under that building. It is a very large brick building. In times of general floods through the valley the water would rise in that basement. While I graded up the ground so that there is a slope from the house in every direction for quite a distance, several rods, so that no surface water could come in, yet the water rose in that basement from an inch or two to on one occasion three feet deep, or twice. As to the width of the Arkansas valley here at Wichita, it is five or six miles wide.

7932 Yes, sir, I stated that I had written an article in 1893 upon the subject of "A Dying River." As to what facts caused me to write that article (objection), I will say, first it is a scientific fact of general interest; next, it is a very marked or unusual phenomenon; and third, I had for many years anticipated very disastrous results in this valley in which I was largely interested. As to the disastrous results which I anticipated (objection), I will say the fact which I anticipated when I wrote that article was that directly south of this city the narrowing up of the river

7933 caused the river to overflow its banks and did me a personal damage and loss to the amount of probably $5,000, and numbers of my neighbors an equal amount, more or less. In speaking of that loss I will say that I lost a thousand valuable fruit trees by the river overflowing its banks and spreading over my farm. On numerous adjoining tracts the crops were totally destroyed and many orchards were destroyed. My own crops on my farm were totally destroyed. (Objection.) In 1877 we had a similar flood in this valley. (Objection.) In my judgment

7934 the water was equally high, or the same volume of water came down these rivers. I at that time owned three farms, several of them, and was personally attending to them, and there was no overflow. As to the result of this narrowing of the channel (objection), I will say the result is—and that is constantly increasing—that in time of flood the river bed cannot contain the water of the river and it will overflow the adjoining valleys. And that is increasing very rapidly. As to the effect of the high water upon these islands (objection), I will say these islands which have

7935 formed from what was originally a shifting sandbar and which in the early days were constantly moving by every flood or rise in the river, moving down stream and shifting and being torn up so that vegetation had no opportunity of taking root, have become fixed. They very shortly are covered with a growth of young cottonwoods and willows which obtain a firm root. The next flood that comes fills them up from a foot to in some instances two feet deep in one season. The young trees continue to grow and multiply luxuriantly right through this added soil and the next flood that comes fills it in again with sand and sediment and clay until what was originally a sandbar becomes a fixed island of the height

of the extreme floods which may come, and at the present time some of these islands are of the same level with the adjoining banks of the river. As to how the flood of 1904 compared in height with the flood of 1877, I will say, owing to the condition of the channel, the river necessarily rose higher and consequently overflowed the banks of the river, which it had never done previously. No, sir, the flood of 1877 did not strike the old wooden bridge that was then across the river. As to how much space there was between the
7936 bridge and the top of the flood (objection), I can't answer that question exactly, but judging from memory it was about two feet.

As to there having been boats on the river along by the city of Wichita (objection), I will say, in the early summer of 1872, as I remember, there was a steamboat built here which ran back and forth from the end of Douglas avenue where it strikes the Arkansas river to a piece of land a mile or a mile and a half south which was called an island but which really was a portion of the mainland and only an island during high water, where there was a picnic ground, and that boat was in use during that summer. I saw boats built here, numbers of them, right at the end of our
7937 wooden bridge, at this end, one of which went from this place to Florida, and the two young men in it wrote letters back that they had safely arrived. (Objection.) I saw the boats built, house-boats, decked in overhead, of considerable size, by which parties went from here down to Arkansas. I saw a boat moored at our wharf on the river here, which the men on the boat said they built in Pueblo and came down to Wichita. (Objection and motion.) There were small boats in use on the river here, which made their wharf right at the end of our bridge, for local use. These boats were here at various times from 1872 to 1880.

Examining Complainant's Exhibit A–52 (objection), I will
7938 say I have on several occasions swum herds of my own cattle across the river, from 100 upward. This is a representative picture, but not a picture taken from actual occurrence. We didn't cross our cattle in that shape. We crossed a hundred in a bunch at a time. No, the artist who drew that was not a good cattle man. If he had been there would have been a camp on this side of the river. There would have been men there to assist in getting out of the river. There would be some wagons there, and there would be horses and other animals on the other bank of the river to attract the attention of the cattle as they came across so they could see an open point and see that there were some other animals that probably had crossed
7939 before them. We would swim our cattle over in bunches. The largest bunch I remember taking across at one time was 125 head of three and four-year old steers, right where the head of Ackerman's island is, that I had bought to issue to the Indians that were located here, for the United States Government, and we swum that bunch of cattle the entire distance across the river right where is now the mouth of the Little Arkansas river. I had my

ferry boat there in crossing. There was nothing of those cattle showed but the faces and the horns. The body was not in view. You could see nothing, practically, but a mass of horns coming. We had men in front of them and behind them and on the sides of them, swimming, and also horses on the bank on the opposite side, so that they could see where they were going to. I think it was probably in June that we would swim the cattle in those early years. During the other times of the year the usual method was to drive the cattle across at the fords. Very often it was shallow so that there was no difficulty in a chosen locality that we would constanly use, and of course we chose the best possible crossing on the river, where the river was wide and where the banks were easy of access
7940 on either side and usually where the buffaloes had made a great crossing and prepared a great highway for us, and the water might be a foot deep and in portions of the water there might be sandbars and perhaps for a considerable distance it would not be over six inches deep.

Yes, sir, I am familiar with the Saline and Solomon and Smoky Hill valleys. Those valleys usually are narrow. They usually widen out, in the big bend of the Smoky Hill, for instance.

7941 (Motion to strike out examination in chief of this witness as not proper rebuttal, and under this view cross examination will be limited to some inquiries concerning dates and matters which the witness has referred to in his testimony in chief.)

Cross-examination.

By Mr. DAWSON:

As to the other year outside of the fall of 1863 that the river went dry, in the '70's, I would say I wouldn't be positive whether that was not in 1865. I know positively about 1863, but the other year I am not positive about. It was along late in the fall.

7942 Examining my article on the subject of "A Dying River," I would say that I remember that in writing that article I believed that was the year, but wasn't absolutely positive about it. To the best of my recollection it was about that time, but I didn't keep any memorandum of it, and the way I came to be forcibly reminded of it, I had been on a hunt and came back and I remember I was feeling quite poorly. We were camped on the bank of the river and it was dry as it could be and there were hundreds of buffaloes right on the river hunting for water. There were several bunches of buffaloes.

7943 As to the fact that the river in the fall of 1904 overflowed its banks and did considerable damage, and as to its being true that the opportunities for doing damage along the banks of the Arkansas river in this county are now much greater than they were in the '60's or '70's, even though the water had gone over the banks at that time the same as in 1904, for the reason that there are more improved lands and better cultivated lands, I will

say, yes, sir, there is much more improved land along the bank of the river now than there was in the '70's. As to the river overflowing its banks in 1867, I will say, nothing to the extent that it has since. Yes, sir, the next large flood was in 1877, and at that time there was considerable territory overrun with water and the water did run through a part of the town site and the streets of Wichita, yes, sir. There was a low place running through what is now Topeka avenue,
a natural depression or slough, and there I think the water
7944 was four feet deep. In the flood of 1904 it probably reached
a depth of sixteen inches. I don't recollect any general flood between 1877 and 1904 that would be anywhere near equal to those two. The flood of 1904 originated in the State of Kansas, yes, sir. That was my information. There has been only one disastrous flood since 1877, and I have no means of knowing the condition of the Arkansas river in Colorado in the year 1904. I attribute the flood largely to the rains in the State of Kansas, but have no knowledge of the conditions of the Arkansas river there. As to the condition of the river at this particular time, the 10th of June, 1905, I have not seen it for a number of days, but the river has been at what
we call high water. Not flood, but simply high water. Yes,
7945 sir, it has been subsiding for the last week. I have read in
the papers telegraphic dispatches that since a week ago today or yesterday and for all of the time since the Arkansas river has been abnormally and extremely high at Cañon City and Pueblo, Cañon City being where the river leaves the mountains, and that it was at flood tide and coming this way. Yes, sir, I spoke of the river many times being clear at the ordinary stage in the early years of my acquaintance with it. In late years it has been muddy. As to what fact I attribute this to, I would say, the result of the settlement along the river and its tributary streams by which quantities of water and mud and filth from cattle and hog-pens and the refuse of towns get into the river. As to whether it is true that many thousands of acres that were in the native sod in the earlier years have been broken up and are now under the plow and that these acres contribute both during dry times when there are high winds and times of excessive rains when the mud and dirt washes into the stream,
I would say, I don't think the wind has any influence in pol-
7946 luting the waters of the river, but the washing away of the surface soil which has been stirred up and the very large amount of live stock which is kept along the river or on its close tributary branches—that is the principal cause of the pollution of the river. As to its being a fact that because of this excessive amount of filth and dirt and mud which the river carries of late years it would build or construct islands and land along its margins more rapidly than when it was a clear stream, I would say, at the time these islands are being constructed the river is always, both before the settlement of the country and since, invariably muddy. It is only when the river is at a low state of water and running a uniform flow that the water is clear. In time of high water the river was just as muddy, apparently, at the time of a flood as it is now—as riley.

I should suppose that there was as much water in Colorado draining into the Arkansas river as there is in the State of Kansas
7947 which drains into the Arkansas river. Perhaps more. Before the ground was broken up there was a very much larger percentage of the water running off the surface than there is at the present time or since the ground was broken up, because it soaks into the ground and there are obstructions to its free flow. Where it falls on a farm of 160 acres which once was a buffalo pasture with nothing but buffalo grass growing on it, now it is being plowed up and in all the ridges and ditches and in the loose soil the water up to a certain precipitation remains on the soil instead of running off. It soaks into the soil.

I have never heard of a case where islands have been attached to the mainland by the assistance of man until I was in court here at the last session where I heard that statement made. That is the only knowledge I have of it.

7948 Yes, sir, in the vicinity of the Douglas Avenue bridge the channel of the river has been narrowed up by filling. The been main river channel has narrowed up about 300 feet, and a low secondary bottom, which existed at the time we built our wooden bridge was about 250 feet farther, that the river overflowed in time of high water—backed over and covered it in very high water, but at other times it was a kind of low, marshy bottom. Yes, sir, there are buildings now existing, business houses of one character and another, on made land along the river at points which were formerly in the main channel of the river. Yes, sir, there was considerable piling driven in the river, but it didn't answer much of a purpose in the way of filling in. The water frequently would wash in behind it and leave the piles out in the river. Swartz or
7949 Swartz Brothers filled in a tract of low land here in Wichita which was once a part of the river. They filled it in and built it up, and it also was filled in by the building of our bridge and the shortening of the bridge, and they have gradually filled this place up until it has become habitable ground, and having occasion to get big prices for their former accretion they sold it and moved down onto this other piece of land.

In stating that after the first ten years after the settlement of this country the river was exceedingly low, I would say that I referred particularly to the years between 1880 and 1890; and as to whether the flow of the river in 1880 had exhibited a marked falling off as compared with the late '60's and early '70's, I would say, I
7950 think it was noticeable that there was a difference in the river before 1880, but not a very noticeable or pronounced difference, and by the year 1880 it was sufficient so that it was observed and spoken of frequently and generally among the people that were here in the early days. As to whether the years 1879 and 1880 were both very dry years and the river went practically dry about the mouth of the Little Arkansas river in each of those years, I can't say. I didn't take any notes of those years, and I find it

very difficult to locate what the condition of the river was at any particular year excepting the years of pronounced floods or some particular incident that has fixed it in my memory.

As to whether I have ever noticed that the flow of the river might be divided into cycles or periods of years; that is, that for a given number of years, five or six or seven, taking the average, the flow would be very low, and then perhaps for another like period the flow would be pretty high, and then falling back to a low flow again, I would say I have observed those changes both in the Arkansas river and the Mississippi and other rivers, but in regard to the Arkansas river I have not observed it long enough to know whether it is periodical or accidental.

Yes, sir, I am fairly well acquainted, and have been since the early times, with parts of the Missouri river, but as to whether the settlement of the country and the march of civilization have made
7951 any change in either the character or appearance or flow of that river (objection), I don't think I am competent to answer that question intelligently. While I have been on the Missouri river every year in that time and have seen it, I have never lived on the Missouri river or paid any attention to it except in a very general way. As to whether my general observations have been sufficient to permit of my stating whether there has been any growth of islands or any narrowing of the banks or any lessening of the flow of the river of late years as compared with the earlier '60's and the years when I knew it, I don't think I am competent to answer that question. I simply see the Missouri river at Leavenworth and Kansas City and the other towns which I visit every year, otherwise I have not observed the river and can't say.

No, sir, I am not sufficiently acquainted with the Solomon or the Smoky Hill river to say whether the settlement of the country and its subjection by the white man has made any difference
7952 either in the character or flow of those streams. I was very familiar with those streams before the settlement of the country but have seen very little of them since.

As to whether I am familiar enough with the Little Arkansas river to state whether it has shown in any way the effects of the settlement and cultivation of the country, I would say, the waters of the Little river have become very much polluted by the presence of civilization and in places obstructed by the people felling trees into the river and also by the diversion of a portion of the waters into another stream for milling purposes here which diverted the flow following the course of the river seven or eight miles above Wichita but in a direct line it is not over four or five. No, sir, that water so diverted from the Little river does not get back either into the Little river or the main Arkansas river before passing Wichita. It runs in the Chisholm creek and from there empties into the Arkansas river about four miles from this place in a southeasterly direction. As to whether the change in the character of the country as to the run-off from the precipitation which it furnishes causes any

change in the amount of the flow in the Little river, I would
7953 say, not very much. The same springs which fed the river originally in dry times, the water which comes from the tertiary gravel which exists farther north, are still in existence, and if there has been a change there is less water in the river that there was in the dry times in the early days. So far as the normal flow of the Little river is concerned, as to whether it depends largely upon springs from the tertiary gravel rather than upon the surface-run-off, I would say, yes sir. The reason we attributed the Little Arkansas river to be an ever-flowing river of pure, clear water, was the springs or its equivalent in waters coming from the sand and gravel underlying.

As to why the river has narrowed so excessively at the foot of
of Hydraulic avenue, I would say, in the first place the river
7954 there by some means was extremely wide. It is the widest place on the whole length of the river to my knowledge, and it is in a place that if any obstruction should occur in that wide space it would be much easier to build up islands where the river is very wide than where it is narrow. Whether such obstruction is occasioned by the filling in of the timber from the banks or other causes I don't know. No, there has been nothing done there by man, any artificial cause that I know of, that has operated to bring about this narrowing to any extent. No, I know of no other reason for the growing of the island at the Lawrence Avenue bridge than is operating at other points along the river. As to the flow of the river at this point for the past ten or twelve months, it has been more than it was on an average for the ten years preceding. As to the average level of the surface of the water within the last ten or twelve years as compared with the average level of the surface of the water in the earlier years as it flows in the stream, I would say that compared for the last ten or twelve months with the average level of the surface of the water for a like period in the earlier times that it is higher than it formerly was. Yes, sir, it is higher now. And the reason for this I believe is that the bed is gradually rising—filling up. I believe the sand is not carried out of the State as it was formerly, and consequently is not moving down stream as it used to be.

7955 As to whether one would have to sink as far, farther or about the same distance to water in the same place here in Wichita now as you would in the '70's, I would say, I judge on this town site the difference is very slight, which I will explain with your permission: The fact of the Little Arkansas river being an ever-flowing stream keeps the water in the Arkansas river below the Little river a constantly running stream so that it has never been known to go dry, and of course in my opinion the underflow
7956 remains at about the level of the water in the river and the fact that the Big river never goes dry below the mouth of the Little river would keep the underflow in this portion of the city at

approximately a uniform level, except in case of floods, which I spoke of this morning.

As to how long within the limits of the city of Wichita it would take for any marked rise or falling off in the Arkansas river to make its appearance in the farther parts of the town from the river, well, I will have to answer that question in my own way, and that is that it almost invariably is the case that when the Arkansas river is at flood tide the adjoining streams are also bank full so that the underflow derives its water from Chisholm creek and the Little Arkansas river as well as from the Big Arkansas river, and also from the water which percolates through from the surface, and within two weeks from the time that all of these streams are bank full the water will commence rising in the basement of my house. As to whether if the level of the surface of the water in the Arkansas river for the past ten months has been as high as in the earlier days or higher, and if I
7957 believe that the river has any influence on the level of this ground water, I would expect to find the level of the ground water lower today than in the earlier times, I would say not on this town site, no sir. As to whether this would be the same at any other place where like conditions exist, I would say my explanation of the effect of the waters of the Little river will answer that question.

As to whether I am one of those who believe that all or practically all of this vast sheet of water underlying the great valley of the Arkansas river and some of the adjacent country is drawn from the Arkansas river or whether I believe that it is a part of the general ground water of the country gathered from the precipitation from the great plains and uplands which is to a certain degree in the immediate vicinity of the river affected by the flow of the river, I will first state that a large part of the State of Kansas, to the best of my knowledge, lying south and west of the Arkansas river at some depth is underlaid by a sheet of gravel and sand containing water. That water is derived from every source, from all of the rains and streams running across the surface. They all contribute more or less. Perhaps it derives some of its waters—these sheet sands may extend back under a portion of Colorado, toward
7958 the mountains, and it may come from that source, some of it. Also in the immediate valley of the Arkansas river I think it is very considerably influenced by the water in the Arkansas river. When the river is up to a good stage of water it flows back through this sand for long distances, and when the river falls it falls into the river and the water in this underflow at different seasons of the year may vary in height by the amount of precipitation which may be over the plains and which sinks down. If it should be a fact that in running levels from the Arkansas river back to the outlying country on each side it was found to be true that after you had left the immediate vicinity of the river, say a quarter of a mile, the level of the ground water or the level of the water in the ground

was generally higher than the level of the surface of the water in the river, as to whether I would then think any of such water was derived from the river or was gathered from the precipitation that had fallen on higher ground at some other point or in the immediate locality (objection), I should suppose that if the water was
7959 found at a higher level away from the river it derived its water from some other source than the Arkansas river.

As to what I meant when I spoke of finding the underflow five or six miles from the Arkansas river, I would say that my opinion has always been that in that particular locality where my farm is situated, lying directly south of the river, the river running east and west, or for two or three miles there running north of east, and this land lying south of the river from three-quarters of a mile to a mile and a half, that the water in this sand was largely derived from the river. That place is due south of the center of the eastern part of the city, from the fact that there is 320 acres of it located on the south half of section 16, and section 16 lies right in the city here, and this 320 acres which lies in an east and west direction directly south of the river and parallel with it is very close to three-quarters of a mile south from the river.

7960 I sank wells on all of these different pieces of land. The present farm which I have lies very close to a mile and a quarter, the north edge of it, from the Arkansas river. Yes, all of this land is on first bottom for miles and miles there in every direction. Yes, sir, those wells I spoke of were driven wells. There are some little narrow streaks of hardpan running through there, and when I have had to sink or drive a well through those I have had to dig down first with a spade until I came to this hardpan and then had to dig it with a pick until I got through that, so in several instances I dug down to this sand. It was so hard it was impossible to drive through it.

No, sir, there is no creek or divide between the point where I sunk those wells and the river. As to there being any old depressions that would indicate that there might have been any old chan-
7961 nels at any time through the bottom land there of the river in the early days, I would say, through the west end of this 320 acres and also through the west side of the land which I now have there is a branch of what is known as the Big slough. It is more in the nature of a creek along there, and during seasons of rain there is quite a stream of water running through there, but in a dry time it is not running at all.

No, sir, on these bottom lands of mine of which I have spoken there had been no permanent fall or dropping of the level of the ground water since I have been acquainted with it for the reason that the Big slough never goes dry there. But whether so far as the conditions under my land are concerned they are just as good for producing crops, so far as that is dependent on water beneath the ground, as they were in the early days, I would say hardly, because the volume in the earlier days was much larger during the

growing season than it is now and brought the water during that season to a little higher level. As to whether the channel has correspondingly narrowed so as to keep the level of the water about the same though the volume is not so great, I would say the larger portion of the river has not materially narrowed directly north of this land of mine. On my lowest meadow land there is still
7962 living water at about four feet in dry times. In parts where the land is higher it ranges from six to ten feet. The surface of the land is a little uneven in places. There are places where it is six feet higher for considerable areas than in other places. During my hunting experiences in the early days, from 1863 up to 1880, I ranged along the river from here to about where Hutchinson is built, and as soon as the Santa Fe railroad was built I was on the first excursion that ran to the State line, with the engineers on the part of the United States to accept the road on behalf of the Government in order to know that they might get their land grant, and as to what was the character of the stretch of the river which lies between Great Bend or possibly Dodge City and the Colorado-Kansas line at the time of the year when the stream would be naturally low in those early days, I would say I can't speak from my own personal knowledge. I can only speak from the information I received from
7963 others, and from reading. As to whether I know from my own observation that there is a stretch between Dodge City and the Colorado State line that is very dry and even in the early days had but little water flowing across it many times in the year, I can only (objection) answer that by information I have derived from other parties, and from hearing that the river there was frequently dry, but don't know it of my own personal knowledge.

Redirect examination.

By Mr. ASHBAUGH:

As to the river being muddy at certain times, I would say, since my first observation of the Arkansas river whenever there comes a flood the water is exceedingly riley. It is full of this adobe soil that comes from the west, and of late years there is more of other material and coloring matter in it than there was then. It was
7964 then more of a yellowish cast, so much so that the Indians named this river Neshutsa, meaning "red water." That is when it was at flood that the water was red. And the Little Arkansas river was called Shinka, which means a calf or young of the Big river, or an offspring.

As to what effect a flood in the Arkansas river would have upon the level of the water in the town site of the city of Wichita if the flood didn't remain more than one or two or three days, I would say it would have no effect whatever, in my opinion. As to how the city of Wichita is bounded by these rivers, I would say the Little Arkansas river, with a slight exception at its mouth, is the western boundary of the city for two or three miles above here. On

the east, Chisholm creek runs through the eastern portion of the city, the city extending on either side, but mostly to the west. For a distance of at least four miles it runs through the corporate limits of the city or that portion that is built up at least; and then the Arkansas river runs through the center of the city, practically, so that the town is practically bounded upon three sides by these streams that I have mentioned.

7965 OWEN B. STOCKER, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Wichita, Kansas, and came here in 1878, and have lived here continuously ever since. I handle building material and metals and crates, at 143 North Water street. My place is north of Douglas avenue and one street west of Main. I have been acquainted with the Arkansas river ever since I came here and do some hunting most every year.

As to what changes I have noticed in the Arkansas river since I came here (objection), well, the change that I have noticed
7966 is that we don't have as much water in the river as we used to. As to other changes, the river seems to be filling up more with islands than it used to. There didn't use to be any islands in the river when I came here. There didn't use to be any such islands as are in the river now, and up the river and down the river. These islands have grown in size, and I think there is more of these little islands that come in the river every year than there were. As to other changes, the river has been narrowed up a good deal. It is not nearly as wide as it used to be, by practically one-half, here in town. As to how far this condition extends, I should think probably down as far as this lower bridge here, the Maple Street bridge, and it runs up as far as the mouth of the Little
7967 river. Yes, sir, I have known the Douglas Avenue bridge all these years. As to how the flow of the river, exclusive of floods, for the last ten years, compares with the flow of the river during the first ten or fifteen years I knew it (objection), in the summer there is a great deal less water. There is no water at all, practically, in the river, only that which comes from the Little river that runs through town here. As to the carrying capacity of the Arkansas river for the past ten years as compared with the carrying capacity for the first ten years that I knew it, the water being at the same height as measured from the banks (objection), well, I should think that just here in the city, so far as—up and down the
7968 river outside of the city limits, that I don't know so much about, but just in the city I should think the carrying capacity was just about one-half of what it used to be.

Yes, sir, I am acquainted with the Douglas Avenue bridge, and I have never seen those piles under the abutments until within the

last year or two. They were exposed last summer. So far as my knowledge of their being exposed is concerned, it has not been more than two or three years, if as long as that. I have never seen them until within the last two or three years. As to the taking of sand out of the bed of the river by any person, as to whether that has affected the level of the water along here (objection), I would say I don't think so. I don't think you could pump sand out of
7969 the river so that it would affect the bed of the river here in forty years. If they did pump some sand out of the bed of the river, as to whether that would affect the level of the water in the river, I don't think so.

Cross-examination.

By Mr. DAWSON:

For the last ten months there has possibly been a good flow of water in the river even above the mouth of the Little Arkansas river in comparison with the last five or six years, yes, sir, but as to there being a good flow for the last ten months most of the time as compared with almost any ten month period since I have known the river, I would say I think not. There has always been water in the river, that is, in spots. There are portions of the Ar-
6970 kansas river that are absolutely dry. Absolutely dry. Not just at the present time, no, but in the summer. As to whether it has been dry for ten months here since last August, I would say last August of course I wasn't here but a year ago last August the river was absolutely dry above 13th street in spots there for half a mile, but as to the last ten months, I was not here last summer and I could't testify to that. I have been here since last September. I came here on the first of September and have not been out of town since. No, I don't think there has been a good, steady flow in the Arkansas river here since last September above the mouth of the Little Arkansas. There has been water in the river, I suppose, but it hasn't been where there has been a current to the water down through the river. No, I don't know that for the last nine months, from September last, there has been a constantly flowing stream all the time in this river and that it has been remarked generally because it has been a better
6971 flow than it had been for some time before. I don't know that. That may be true, however, but I don't know it. I know this, that I was out hunting some in September up along the Big Arkansas river and that we had to take the dogs over into pools on the Big Arkansas river to get water for them; that there was no current of water except in places along the river. That was last year. As to whether they keep a gauging station at which daily readings are made of the river, I will say, I don't know that. I am not enough interested in the river to keep track of it every day. As to whether it is a fact that after the flood of 1904 there was a great public sentiment against the people who had been arti-

ficially narrowing the channel of the river and that more or less effort was made to compel or induce the city government to take some steps to do away with the artificial narrowing of the stream through Wichita (objection), I will say, well, I think there has been some talk through the papers here of having the city do something, or some one who had the authority, to stop these people from narrowing up the river.

(Complainant's Exhibit A–52 offered in evidence. Objection.)

7973 WILLIAM MATHEWSON, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Wichita, Kansas, and am seventy-six years old. I came from the State of New York in 1849, and first saw the Arkansas river in 1851 where Pueblo is now. I first settled upon the
7974 Arkansas river at Great Bend, and have now lived at Wichita thirty-four years. I was an Indian trader at Great Bend for seventeen years, from 1852 to 1867, and I have lived in Wichita continuously since 1867. From 1852 to 1867 I was up and down the Arkansas river from Pueblo to Ford, and have seen it and crossed it a thousand times, I guess, at least a great many times and in a great many places. I have crossed it and recrossed it.
7975 I moved the Indians into the Territory. I had two big mule trains hauling supplies for the Government, and of course at different places I was crossing it more or less from Dodge City to Camp Supply and Fort Sill, and from here across and then back and forth to and from the Territory, hauling Government supplies.

Yes, sir, I own land in Sedgwick county and also land in the city of Wichita. I entered my land in Sedgwick county in 1869 and have owned some of it ever since. I have made four additions to the city of Wichita. I live half a mile north and three-quarters of a mile east of the postoffice in Wichita, on Central avenue.
7976 As to the Arkansas river as I saw it from 1852 down to 1867 when I moved to Wichita, I will say, the Arkansas river was then larger and wider than it is now, and deeper. (Objection.) I say the river was larger—that is, a wider stream, and it carried more water when I first knew it for years, and there were no islands in it—I don't think there were but two regular islands in the river. One was right here and the other was up this side of Valley Center. The river seemed to be wide and clear so that there was nothing in the way at all, and I think the river was deeper at that time
7977 by considerable than it is now. As to how long that condition existed (objection), I will say it existed probably away long up into the '80's—probably 1885 or 1886 or somewhere along there. I wouldn't say particularly what year, but it was along about that time and there was not nearly as m ch

water in the river, and the islands—the tow-heads—commenced building up all along the river. By a tow-head I mean a little island formed on a sandbar, and probably some little willows or something will start in the first place, and as the water depreciates in the river of course it will increase and grow and keep growing until it will form quite an island. In the first place it is a little bit of a kind of a tow-head and you can't just see it. When the water is tolerably high you can just see the top of it sticking out. I know that was the way that Ackerman's island here in the city of Wichita was formed. I have crossed that many and many times right there where that island is and there was no more island there than there is right on this floor.

7978 As to the changes in the river, there is not nearly so much water in it and the river is not as wide and the islands are forming all the time, constantly, and are continuing to increase in number and size down to the present time. I couldn't say how large Ackerman's island is down to the present time, perhaps a thousand or twelve hundred feet in length and probably two or three hundred yards wide. It was covered with trees the last time I saw it. It was covered with timber all over, and has been covered

7979 for some years, yes, sir. I noticed this change that I have spoken of becoming material and particularly noticeable (objection) about fifteen or sixteen years ago. Yes, sir, I have had a great deal of experience up and down the Arkansas river in the early days and was familiar with it for a number of miles. (Objection.) In the first place, being an Indian trader, and because most Indians were south of the river and I lived north of the river, I had to cross the river to go to them and had to go to camp and had all the business of trading and transacting business; and furthermore, in an early day the agent for those

7980 Indians was either Kit Carson, Colonel Bent or Colonel Boone. They all lived up around the mountains. They didn't like to live down in the country. It was very dangerous there and they told me I would get killed and scalped if I lived there. Well, when they got any information from Washington they wanted to convey to the Indians, they being three or four hundred miles up the river and I being more familiar with the Indians that way they would ask me to go and communicate with the Indians and get the answer of the Indians, and so they kept me busy doing that kind of work. Then there is another kind of work—all the freighting that was done in the West here for New Mexico and Arizona was done in wagons. The Overland Transportation Company. Going through the land here there were millions of buffaloes for two or three hundred miles wide. They would stampede the cattle and mules and run them off. I was employed by these companies, knowing the country as well as I did, to hunt up their stock; that is, the wagon masters would come right to me if they lost any stock. They would either come or send a message to me to come at once. Well, I would go, of course, and take the trail. I could direct them right through

the buffaloes. Sometimes the big herds of buffaloes would take them across the river and scatter them. I would go into the country after they got settled down and pick them out and bring them back. Most of my business was in the saddle in the summer
7981 time, hunting the stray stock, and of course I was all up and down the river and I was crossing and recrossing the river nearly all the time. I was in the saddle the biggest part of the time. As to my particular experience in killing buffaloes (objection), why, I expect I have had as much experience as any man in America in that. Yes, sir, that experience gave me a particular name in this country. (Objection). It was killing buffaloes for the first settlers of Kansas that I got the name. It was either the grateful or ungrateful people among the first settlers of Kansas who gave me the name of "Buffalo Bill," and I was the only man that was ever known on the plains by that name. (Objection.) There have been others written up in dime novels, but they never were
7982 on the plains.

As to the carrying capacity of the Arkansas river at the present time as compared with the carrying capacity fifteen or twenty years ago, the water being at the same height as measured from the banks (objection), I will say the river is such at the present time and has been so for several years that I don't think it would carry over two-thirds of the water it used to carry years ago, on account of the islands and the obstructions in the river, and it couldn't carry as much water now at the same height as it did more than fifteen years ago without overflowing the banks.

7983 Yes, sir, I am familiar with what is known in this country as the underflow. As to how far back from the Arkansas river the underflow is perceptible (objection), I will answer, why I have dug wells for irrigating purposes a mile and a half from the river right due east from here, right on my home ranch where I live now, within the corporate limits of the city of Wichita. When I dug those wells (objection) or that particular one there which was a larger one than any of the others I ever dug, it was rather a low stage of water, I think, and it was rather a
7984 high piece of ground that I dug the well on. I think I went down about eight feet to water. I went to work and put in frames and curbed it or drove down plank all around and sank the well probably four feet. I took the sand out to make it as deep as I could get the water out. I noticed that when the river would rise it would rise right up in that well, and lower, just according to the height of the river. It would be lower when the river went down, and when the river got so there was no flow in it there was no water in the well. That it almost due east on Central avenue and just half a mile north of Douglas avenue. As to what effect the rise
7985 and fall of the water in the Arkansas river has upon the cellars in the city of Wichita (objection), well, I can speak for my own individual cellars. Of course I have seen some others, but in my own individual cellars,—I built my house 34 years ago. My

intention was not to dig the cellar very deep, and when I let the contract they dug it a little deeper than I intended they should dig it, but it was all right for a while until the river got high and then the water got high in my cellar, but when the river went down, why, of course the water went out of my cellar and I had it cemented. The next time there was a big rise it just lifted the whole cement right up and filled my cellar again. I had three or four experiences of that kind, and finally I filled it about a foot deep with broken rock and cement and probably put about two inches of cement over it and cemented the sides clear up to the top of the ground or higher, and since that time I have not been bothered with water. But I don't know what it is doing now from my own experience, but it don't get into the cellar. As to where that water came from, I suppose it came from the underflow from the
7986 river. It came from below, and of course it rises and falls just as the river rises and falls. As to having noticed this also in other cellars, why, I have seen them full, that is, I have seen a good many cellars just in the same fix my own was in the early days, but I think most of them are cemented and they keep the water out.

As to how the flow of the river during the dry season of the year above the mouth of the Little river has been for the last six or eight or ten or twelve years (objection), I will say that in some portions of the year it has not flowed at all. There hasn't been any flow—just a dry desert.

The first cultivation of crops in this country was on the bottom lands, and the first considerable entry of lands was made in 1870 and 1871 (objection), but mostly in 1872 after the railroad got in here and there was a big immigration came in and filled the
7987 country up. The United States Government survey was made of the lands along in this part of Kansas in the year 1867, and I was here at that time.

Cross examination.

By Mr. DAWSON:

No, I didn't see any irrigating ditches up there at Pueblo in 1859. I don't think there were any, or if there were they were very small affairs. I don't recollect that. As to whether there were some small ditches being used there by Mexicans as early as 1859, I saw some little ditches that didn't amount to anything. Of course there was no land, hardly, under cultivation. They were digging little ditches there. As to whether the river has been artificially narrowed about one-third at the Douglas Avenue bridge as compared with its width in the earlier years, I would say, it has been narrowed here. I suppose it has been artificially built up here two or three hundred feet, but it is also natural. Of course the brush and
7988 stuff is grown up on the river on both sides away above the city of Wichita all along up and down the river. If any one

will take the pains to go and observe it they can see that very plainly.

As to how soon a rise in the river will show in my well, I couldn't tell that, but just as soon as the river rose. At the time I dug the well probably it was a month before the river rose, and it would appear in the well almost immediately. This well is right east of here, in fact it is you might say a little above the mouth of the Little river. The Little river and the Big river come together just about or very nearly on a line west of where I dug this well. No,
7989 sir, my well is not between the two rivers. It is not in the fork of the streams. Yes, the Little river does go dry. I have seen it dry twice in my life. In 1860 there was not a drop of water in it and there was not a drop of water in this river; and then I think in 1863. That is, there might have been water down here, I wasn't here, but away above here forty or fifty miles from here until you get up to the head springs it was dry. The springs at the head never go dry. As to there being a stretch of the Arkansas river from Great Bend or at least from Dodge City up to the Colorado line that has always been very subject to going dry, I will say, well, in some cases. I have seen some seasons it was pretty nearly dry. It would stand in pools. September is the worst month we have here for dry weather. Yes, sir, the river was dry about Dodge and west of there for a distance toward the Colorado State line in 1860, and in 1863 I don't know how far it extended west. I know from here up to about Dodge City it was very nearly dry. As to the chances of it being dry west of Dodge City when it is dry
7990 between here and Dodge, I would say I don't know. I don't think so. No, sir, it was not dry a great many more times between Dodge and the Colorado State line than it was east of Dodge. No, sir, nor south. You take it from here to Dodge, with the exception of one or two streams that run into it—I have travelled up and down the river freighting a good deal and I know you can find water a great deal easier up about Dodge or Cimarron crossing and from there up than we could this side. I don't think I ever did see the Arkansas river dry at Pueblo, and as to its being true that there is a strip between what is now known as Coolidge, Kansas, and Dodge City, that the river went dry more than on any other reach of the river that I know of, I would say, no, sir. I have seen it dry more from Dodge City or—well, there was no Dodge City then, we used to call it the Cimarron crossing. That was before Dodge City was built. The old freighters knew it as Cimarron crossing, above Dodge City. And from there down this way we had more trouble to get
7991 water for our stock than after we got above there. No, I don't think the river was dry in 1865. It might have been so dry that it didn't run, but it stood in pools. I think there was a time, probably, when it was dry in 1865, that is, no continuous flow. I was not far up the river in 1868. Down here there was water in the river. It was not a continuous flow in 1874. It stood in pools. In 1879 and a part of the year 1880 I think there might have been a

short period that the river didn't run, but most of the time in those years you speak of there was a channel in the river. That is, the water was perceptible in the river where it flowed. I was freighting up and down the river in those years myself—in 1879 and 1880. As to the fact that during the latter part of the summer and fall of 1879 and part of 1880 there was no continuous flowing stream in the river over part of the course between Dodge City and the Kansas-Colorado line, and whether those two years were very dry, I would say,
7992 well, I don't recollect. I forget. I know we were not bothered in getting water when we were freighting, because we had big freight teams and I know there was plenty of water along the river. But I don't recollect the amount of water, it was so long ago. I know up in Colorado and around the mountains it was very dry in 1879, the driest I ever saw the streams. The mountain streams were lower than I ever saw them.

As to whether the river has gone by periods or cycles, that is, that there would be probably five or six or seven years when it would be very low on the average and then there would be five or six or seven years when there would be a much better flow of water, I would say I never noticed that very particularly in the last ten or fifteen years—the last fifteen years. Sometimes we have some seasons when we have no flow in the river here at all the year round. Of course long before that there used to be plenty of water in the river with the exception of now and then a year. Of course the years I speak of were 1860, 1863, and in 1865 it stood in pools. It was not as dry as I have seen it at other times. As to what constituted plenty
7993 of water in those days, and whether if there was plenty of water in pools to water stock that constituted plenty of water for the uses made of the stream, I would say of course all the use that was made of it or that we could make of it at that time up and down the river here was watering stock for freighters. We had no other use of it. There was no farming or anything.

I put in about thirty years carrying messages to the Indians and capturing stock that had been stolen, and things of that character. As to where Kit Carson and Bent and Boone were located at that time, Bent was an old Indian trader, you know, and Boone lived up on a stream that runs into the Arkansas river from the north side that I cannot speak the name of now. Carson was at Taos. As to why they lived up there instead of down where I lived, I will say they tried to make me believe that the Indians were dangerous down here. They objected to my coming down here to build this
7994 trading post, that the Indians would kill me in less than two years. They thought it was not safe for a man to come down here to start a trading post with a few men, that all these wild Indians in this country were dangerous, where there were thousands where there is not one now. If there was an outbreak there would be but little chance to get away and there would be a massacre. They did massacre some up here. Kit Carson was more particularly looked upon as a man of extreme courage in the western country in

the early days, because he took a very active part in the Indian wars. The others did not. This reputation which Kit Carson bore was well deserved. If any man in the world deserved it he did. I served under him personally. My first experience in Indian fighting was under Kit Carson.

Yes, sir, I was living last summer and fall in Wichita.

(Counsel for Colorado declines to examine the witnesss further, especially upon those matters which have been objected to as clearly not rebuttal.)

Recross-examination.

By Mr. ASHBAUGH:

7995 As to the river going dry in the early days in certain years, I think there was about three months in the Arkansas river in 1860 that there was not a drop of water, and I don't know but it might have been longer than that. In all these streams. Nearly all the streams were dry in the country and the buffaloes perished by thousands and hundreds of thousands for want of water. Yes, sir, that was the greatest drought in this country in all my experience. As to how the periods in the early days when there was no water flowing in the river compared with similar periods in the last fifteen years, as to being longer or shorter, I will answer, oh, as a general thing it was of shorter duration a great deal in the early days.

The Mr. Boone that I spoke of was a nephew of Daniel Boone. One of them settled at Westport and the other one went on to the frontier.

7997 WILLIAM FINN, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live near the city of Wichita, at the north line of Sedgwick county. I have lived there since 1870 or 1871. I came to Sedgwick county first in 1869 and settled here in Wichita and have lived in Sedgwick county ever since. My first business was locating settlers and surveying. I believe I made the first plat of the city of Wichita.

And then I taught school the first winter here. I was sur-
7998 veying until about 1871. I located all the first settlers around Wichita or around where Newton is now, clear out to Great Bend, and on Cow creek where Hutchinson is now. I have been in the grain business all these years since I quit surveying, and in merchandising, and I get more knowledge in that way of the lands than I do of the river. I have been on the river but very little in those years. I was fairly familiar with the Arkansas river during the first ten years I was here. As to how the river appeared during those years (objection), the river when I first saw it right here

where the cattle trail ran across was always full of water—that is, not full but there was always running water across there. There were some ripples in it where the sand bars were, but it was most always fordable here. At certain times of the year it
7999 was not safe to cross it, but we always had to get across in some way. There was no other way of crossing it only to ford it. I don't remember when the ferry was built nor when the first bridge was built here. As to the river in appearance then being wider than now (objection), I have not been right on the river all these years, but have been up there to Jewett's farm several times and have heard Mr. Jewett tell about it. (Objection.) Sedgwick is back from the river about seven miles and Jewett's farm is about the nearest point.

I have heard about what the people here call the underflow.
8000 As to what I know about it (objection), I have handled grain there ever since it was raised and we have always contended (objection) that the water flowing down that great river is always a help to us, but I think it was in 1880 or 1881, I don't remember which, but it was one of those years, it was a very dry year the country over. Kansas didn't raise any grain nor any corn. There was none raised in eastern Kansas here and none in Missouri, and yet along that river we had as big a crop of corn as we generally get at any time, because we had water to supply it. I was handling grain and we supplied eastern Kansas, and we ran corn into Missouri, and we ran the price up—I think that following spring
8001 it was seventy-five cents a bushel on the streets of Wichita, and all along that river as far as we could hear from—Sterling and Hutchinson and down there—they had good corn. I know our farmers thought they had a bonanza, because they went to getting buggies and everything else, and the first thing they knew they were "in the soup" again. I was carrying them, too, by the way. We attributed the successful raising of the corn that year to having plenty of water in the Big river. As to how far back from the Arkansas river the underflow extends, I do not know. (Objec-
8002 tion.) I couldn't state the exact section that it would stop at. I think the air is more or less saturated from that river when it is full of water, outside of that underflow. As to how far back that extends, I couldn't say. Yes, sir, I have a farm near Sedgwick now. The underflow does not extend back to my land. (Objection.) My land is on the east side of the Little river. I am on the upland partly. As to how far back I have noticed the influence of the underflow on the west side of the Little Arkansas river near Sedwick (objection), I will say, personally I don't notice those things. I have heard them talk about it. They come into the grain office there and the farmers tell how they have to dig their wells lower. (Objection.)

8003 As to how the flow of the Little Arkansas river near Sedgwick is during the dry season of the year when it is not affected by rain, I will say the Little river runs pretty regularly

whether it is wet or dry. We don't seem to have much change in that. Now, the wells near the Little river are affected when the Little river is high. I had a well there close to the Little river where my home was and I could always notice when Sand creek was up—it was backed up by the Little river. I was on Sand creek. It
8004 always affected my well there. Sand creek has its source away up above there in McPherson county, I think, on the east side of the Little river, and it empties into Little river at Sedgwick. Yes, sir, there are springs along the Little river. As to what effect the condition of the Arkansas river has upon those springs (objection), I will say, at an early day I didn't notice the underflow, and in fact we hadn't thought about it at that time. I never
8005 heard it mentioned in those first years. As to their having a big corn crop on the west side of the Arkansas river when there was not sufficient rain to mature it (objection), as I said before, I think it was due to more moisture given off from the river during a June rise. As to how far back from the Arkansas
8006 river I knew that there were good crops in that dry year, I will answer, all the way from the east hills clear across the Big river on the west side, and that would be at least twenty miles wide in there or more. Beyond that we didn't have good crops there east of Sedgwick on the uplands. I know that. Newton used to come down there to buy corn of us that year. They used to call that the Egypt. And Newton is only seven miles from us by rail.

I don't know how the rainfall was that year, but I know it was light. Yes, there was a strip of land about twenty miles wide up and down the river there that produced a good corn crop that year when the rainfall was light. And another thing, we never thought in those early years of having a failure in corn between the rivers, because we felt that the Big river was giving us the supply of moisture necessary to make the crops, and the facts are they couldn't raise corn around Newton on that upland. Year after year those people came down there for corn. I used to sell it to them, and I used to buy it from around here, yes, sir. I think that
8007 moisture was evaporation, and also moisture from beneath the ground. (Objection.) I have always thought that that moisture that went to mature that crop came from beneath the soil (objection), that it was the underflow that helped us, in fact I have always felt that we never got too much water coming down that Big river. I have been buying corn and wheat and all kinds of grain there in Sedgwick since 1871.

Recross-examination.

By Mr. DAWSON:

8008 Yes, sir, most of this land I speak of lies in the delta between the Little and Big rivers. No, sir, I haven't gone personally into investigating the soil to see where any of this under-

flow or ground water as it is called comes from. I judge from results.

8009 RANSOM H. BROWN, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I am the Ransom H. Brown who testified for the complainant when it was taking its testimony in chief. I am city engineer of the city of Wichita. As to my having made surveys of the Arkansas river and run levels in Sedgwick and Reno counties since last August, I will say, between the dates of November 14 and December 2, 1904, I ran levels north and south of the Arkansas river at Mount Hope, Kansas, and north and south of the Arkansas river at Wichita, Kansas. The purpose was to check upon levels that were run by Colorado engineers, as I undersood it. I had at that time a
8010 copy of the evidence of Professor Carpenter given in this case on behalf of the State of Colorado. I ran over the same lines that Professor Carpenter testified that he had run. Those lines are north and south of Mount Hope, and the lines north of Colwich. As to the line north of Mount Hope, referring to my memoranda which was made at that time and which is correct, I will say that I started where the bridge is across the river just north of Mount Hope and found that there were 3.48 feet of water in the river, and at a point 2,640 feet north of the river we dug a well and there found the water in the ground .7 of a foot above the water in the river. At 2⅝ miles north of the bridge we dug a well and there found the water in the ground 7.82 feet above the water in the river at our starting point. At 4⅛ miles north of the bridge we dug a well and there we found the water 11.32 feet above the water in the river at our starting point. The elevation of the water or depth of the water in the river at the time I made my levels was different from the
8011 water that Mr. Carpenter reported. The levels practically agreed with what Mr. Carpenter found as being the height above the levels of the water in the river. These measurements practically agreed, in all cases, yes, sir. Yes, sir, this line was run due north from the bridge at Mount Hope. No, sir, that line is not anywhere near at right angles with the current of the river. It was an acute angle. The river has a course running southeast at about a 45 degree angle without section lines. I took the course of the river and drew a line with the general course of the river and from that line I ran at right angles to strike the point where we dug these wells. Then I ran the levels up the river, and found that the water in the river was on a level at right angles to our wells. The water in the river was on a level with the water in the wells at right angles to the water in the wells. In some places we took the wells of the Colorado engineers, but where their wells had water in them we dug
8012 other wells about ten or fifteen feet from them. We found their wells, every one of them, and some had so much water

in them that we dug new wells. From my actual measurements, as to how the water stood in these different wells as compared with the water in the river when we measured it at right angles with the river, I will answer, it was on a level, and that continued as far as we went, yes, sir, and we went 4½ miles from the Mount Hope bridge. The fall of the Arkansas river through that part of the county varies. Some miles have a fall of 4½ feet, some have a fall of 6 feet to the mile, and the greatest I have found was 8 feet to the mile. In going north on this line from Mount Hope I found some lakes in the immediate section of these wells. As to the location of the lakes, at our well which was 2⅝ miles north of the bridge we found two little lakes south of the well—one of them about ⅛ of a mile and one about ¼ of a mile south, and a small lake about ⅛ of a mile west, and a small lake ⅛ of a mile east, and then there
8013 was Patterson's lake, which was about one mile northeast. Patterson's lake is, I should judge, about ⅝ of a mile north and south by half a mile east and west. Then at our well that we dug at 4⅛ miles north there was Patterson's lake, which was ¾ of a mile southeast, and a small lake half a mile west and a small lake a mile and a half north. Yes, sir, I took the level of the water in these lakes. As to how the level of the water in these lakes compared with the level of the water in the river when measured from a line drawn at right angles with the general course of the river, I will say, it is above the water of the river. The water in the lakes is above the water in the river. I don't know what is the source of the water in those lakes. (Objection.) They have no inlets, *so*, sir. I think their sources are from springs. They are surface lakes and are fed to a certain extent from springs. As to the lay of the land around those lakes as to sloping from the lakes or toward
8014 them, these lakes are all in what I would call a punch bowl formation, or a globe. The ground is higher around the lakes. The level of the ground is such that some of the water from rain would drain into these lakes. As to how much higher we found the water in any of these lakes above the level of the water in the river, drawn on a line at right angles from the general course of the river, I will answer, at a well 2⅝ miles north of the bridge the elevation of the water in a lake which was ⅛ of a mile south of the hole was 2.6 feet above the water in the river at right angles to the river. As to how the level of the water in the lake compared with the level of the water in the well, there is 2.6 feet difference between them. The lake is that much higher. That is the only lake I took the elevation of.

I made some measurements in other directions than on the north side of the river, yes, sir, right close to the bridge. As to
8015 how I found the water level in those measurements, I will answer, I found the water level there .13 feet below the water of the river, and the point of comparison was the river at the bridge. As to how that point would be in comparison with a point in the river at right angles to the general direction, I would answer, it

would be about half a foot below the water. If the water is supplied to any of those wells from the underflow of the Arkansas river, from my observation and experiments, as to where that water would leave the river, being above or below a point that I designate the point at right angles to the river (objection), I will answer, it would leave it above; that is, it would leave the river above the point at right angles to the river, and this would be on an average of five feet to the mile, I believe.

Yes, sir, if water came from the river two miles above the point at right angles, it would come at a point about ten feet above the level of the water at the point where I designate it to be at right angles. (Objection.) And that would continue on as we
8016 went up the river, yes, sir. Yes, sir, I took each of the wells that Professor Carpenter had previously measured on the line running out north from the Mount Hope bridge and I ran a line from each of these wells to a point at right angles to the general direction of the river, and I found in each case that the level of the water in the wells was the same as the level of the water in the river at that point, yes, sir.

Yes, sir, I ran some levels and made some surveys on the south side of the river at Mount Hope. I started at the same bridge and ran south three miles. That runs through the center of the town of Mount Hope. At one mile we dug a well and we found the water there 1.73 feet below the water in the river at the bridge. At
8017 three miles we found the water in the ground 6.04 feet below the water in the river at the bridge. In both of these measurements I am taking the surface water at both places.

I ran other lines south of the river at Colwich. I ran a level from this well three miles due south of the river at Mount Hope across to the river in a line at right angles with the general direction of the river. I also ran the levels down the river to get the fall of the river from the bridge—to get the elevation of the water at right angles to the point. I found the water in this well three miles due south of the bridge at Mount Hope on a level with the water in the river at a point at right angles to the general direction of
8018 the river. I ran a level from the first well south on the line from Mount Hope and in a line at right angles with the general direction of the river, and I found the water in that well on a level with the water in the river at that point. (Objection.)

Yes, sir, I made a map showing the location of each of these wells and of the points at right angles to the general direction of the river that I have spoken of. In the measurements at Colwich I
8019 started at the bridge which crosses the Arkansas river north and east of Colwich and I ran due north four and a half miles on the section line. These are the lines over which Professor Carpenter ran, and are described in his testimony, and we found his wells. At ⅛ of a mile north we dug a well and found the water in the well .08—practically one inch—above the water in the river. At 1⅛ miles we found the water in the well 3.66 feet above the water

in the river. At 3½ miles we found the water in the well 7.16 feet above the water in the river. At 4½ miles we found the water in the well 9.64 feet above the water in the river at our starting point, which starting point was at the bridge. My recollection is that my measurements and those of Professor Carpenter practically agreed, that the difference between the elevation of the water in the river and the elevation of the water at those wells, the water being different in the river at the time I took it, and of course he would find it different in the well. I ran
8020 a level from each of these wells to a point in the river at right angles to the general course of the river, and I found the level of the water in each of these wells on a level with the water in the river at a point on the line at right angles to the general course of the river. The river runs through there in a somewhat crooked direction. The nearest point in the river to the water in the well 4½ miles from the Colwich bridge is about two miles west of the Colwich bridge, and the fall of the river through there is about five and one-half feet to the mile. It varies. At a point up the river two and one-half miles from the Colwich bridge the level of the water in the river would be about twelve or thirteen feet above the level of the water at the bridge, yes, sir. As to where the water
8021 would come from in the river to reach or affect the level of that well 4½ miles north of the Colwich bridge (objection) I will answer, I can't tell what point, but it would be several miles above the Colwich bridge. If it were more than two miles above the Colwich bridge, the level of the water in the river at that point would be above the level of the water in that well. Yes, sir, that would be true in case of each of those wells that I measured. I ran some levels south of the bridge near Colwich, 4½ miles south; at one-quarter of a mile we found water in the well dug by the Colorado parties 3.01 feet below the water in the river at the bridge; at one mile we found the water 5.28 feet, in a well that I dug, below the water in the river at our starting point at the bridge; at 1½
8022 miles we found the water in the Colorado parties' well 6.54 feet below the water in the river at the bridge, our starting point; at 2½ miles we found the water 10.47 feet below the water in the river at the bridge; at 3½ miles we found the water 12.27 feet below the water in the river at the starting point; at 4½ miles we found the water in the well 17.12 feet below the water in the river at our starting point.

I had no records of the measurements made by Professor Carpenter of anything south of the river. I was told these were the Colorado wells by their engineer. I didn't run a level from all of these wells south of the bridge near Colwich to the river in a line at right angles with the general course of the river below the bridge; I just took the levels down the river one mile. I found the water in that well on a level with the water in the river at the point where the line reached the general course of the river at right angles. These are all the measurements that I made.

8023 Yes, sir, I can make a plat of this map that I have so that the same may be introduced in evidence by to-morrow.

From all of these measurements that I have made as surveyor and that I know to be correct, as to the general water level of the underflow on each side of the Arkansas river at the points of
8024 comparison (objection), I will say that wherever I have made surveys I have found the underflow on a level with the water in the river at right angles to the water in the river. My recollection is that just prior to the running of these levels there was more water in the river than usual, but the water in the river had not changed within a few hours or so before I ran these levels so as to affect the level in any of these wells, and the water in the river had been stationary a sufficiently long time for me to determine the connection between the level of the water in these wells and the water in the river at a corresponding point, yes, sir. (Objection.)

From my observation and measurements, as to how much
8025 the Arkansas river has narrowed through Sedgwick county during the number of years with which I have been familiar with it (objection), I would say I would estimate it in the neighborhood of one-third. It may be a little more or a little less. In some places it has narrowed a great deal and in other places it is less. Taking it on an average, it may be a third of it. In some places it is a great deal more than that. As to the condition of the river channel that is still in existence and in respect to islands and sand
8026 bars, (objection), there are a great many islands in the river that have been formed there in the last eighteen years since I have known the river, and those islands have grown larger and are now continuously growing larger except during high water, yes, sir. As to the effect of high water if continued for two or three weeks upon these islands, the high water has deposited sand and built them higher in a great many places. Ackerman's island I should judge at the present time contains about sixty acres. It now extends south of the Douglas Avenue bridge I should judge about fif-
8027 teen feet. (Objection.) That island extends under only one span of the bridge, I think.

If sand should be pumped out of the bottom of the river below the Douglas Avenue bridge, as to whether that would affect the level of the water in the river at the Douglas Avenue bridge and as to whether it has affected it by so having been pumped out (objection), I will answer, it has not to my knowledge.

As to the carrying capacity of the river to-day in comparison to the carrying capacity of the river when I first knew it, the water being at the same height as measured from the banks (objection), I will say it is now somewhere between one-half and two-thirds of what it used to be, I should judge. It is materially less, and
8028 is at least a third less, anyway. As to what effect it would have upon the bottom lands along the Arkansas river for a number of miles both above and below Wichita if the amount of water should now come down the Arkansas river that in the early

days would have filled the river channel practically bank full as measured from the banks (objection), I will answer, the more water we have in the river the more water we have in the underflow, or what I call the underflow—in the ground. Further answering, I would say, the bed of the river is not as deep as it was, and the islands have taken up a great deal of the channel and our banks have narrowed. I know at Douglas avenue there has been about three hundred feet taken out. The river hasn't got the
8029 carrying capacity it used to have. If the same amount of water should now come down that used to fill the banks, it would have to break over somewhere.

As to how far back the amount of water in the river influences the level of the underflow on either side of the river (objection), I will answer, three miles is the farthest point I know of, and it does affect the level of the underflow three miles from the river, in my judgment, based upon my observations. As to how the amount of water in the river affects the cellars in Wichita (objection), I know when we have high water in the river we get it in our cellars, and when the water goes down in the river it goes down in the cellars. No, sir, that does not overflow the banks nor go into the cellars from the top; it comes up; that is the way mine did in my
8030 cellar. Yes, sir, the amount of water in the river affects the cellars in the city of Wichita more than one thousand feet back from the river. (Objection.) I know that.

(Complainant's Exhibits A–62 and A–63 offered in evidence.)

Cross-examination.

By Mr. DAWSON:

Yes, sir, I said that the bed of the river had been filled up some and was higher than it was when I first knew it. As to how high the river was at an ordinary stage in the early days, or in other words, as to how high the banks were, the average height of the banks through this county, I would say there are some places we have no bank at all. It is a gradual slope up. In other places we have banks, but the banks vary from nothing to four or five
8031 feet. As to how high the surface of the water would be above the bed of the river when the river was flowing just an ordinarily good stream as when I first knew it, I would say perhaps a foot or a foot and a half of water or two feet. Yes, sir, it is a wide and shallow stream in its nature. As to how much the level of the bed of the river has been raised by the washing in of the sand and dirt from the ploughed fields and lands and other causes, approximately, I would say I should judge somewhere in the neighborhood of a foot and a half here at the Douglas Avenue bridge. I think that is about general clear through.

If the level of the surface water flowing in the river determines the level of the surface of the ground water or underflow, and if there is any water flowing in the river to-day, as to whether the sur-

face of the underflow must necessarily be higher than it was when I first knew the stream, I would say it must, yes, sir. Whether the river be low or high, if its bed is a foot or a foot and a half higher than formerly, then if the river controls the level of the water in the ground, as to whether the level of the underflow as I call it

8032 should be from a foot to a foot and a half higher with the water at the same stage as when I first knew the river, I should say it must, yes, sir. The stream has been narrowed pretty nearly one-third here in Wichita at the Douglas Avenue bridge by artificial means, yes, sir. I have heard talk to the effect that during the flood of 1904 there was quite general complaint made in the city and a general talk of urging the city government to correct the evils that had been brought about by the narrowing of the main Arkansas river at the Douglas Avenue bridge and other places and the interference which had been had with the flow of the Little Arkansas river, yes, sir. No, sir, I made no plans or suggestions as an engineer of how this condition that has been brought about by the people of the city could be corrected. Well, I believe I did, too. I suggested that Ackerman's island ought to be taken out for the protection of the city. I don't know of any fixing that is needed by reason of artificial interference with the Little river.

8033 As to the dry months here, the months of the least precipitation, and as to how September, October and November would compare with any other three months of the year, I would say that in October and November I have seen the lowest water here, I believe.

I have been engaged in surveying and engineering work almost ever since I have been here, and I have done lots of work in the city and out of the city and generally all over the country.

No, sir, I have never taken much notice of the effect of the rainfall upon the level of the ground water, and as to whether I know that the level of the water in the ground differs at different times of the year, even though it be beyond the influence of any flowing stream, I will say it does, when we have had heavy rains; and the ground water is higher after a series of months in which the greatest precipitation of the country falls as compared with any other period of the year, yes, sir. As to whether I know why it was that I chose the months of November and early December, or why I was directed to do so if I did not make the choice, for conducting my investigation as to the level of the ground water at the time following about the driest three months of the year, I would say I do not. I had nothing to do with making the choice. I was engaged to go and do that. They had the money and I was willing to take it, that is all.

8034 No, sir, there were no times while I was in the field that there were extensive rains, and I don't know of any, no, sir. We were only in the field five days. No, sir, we were not out all the time between that date of November 14 and some time in De-

cember. We were in the field November 14 and 15 and November 29 and 30 and December 1.

No, sir, I have no notion as to how long it takes water to travel through soil such as that in the locality where I ran these levels a distance of a mile, two miles, three miles or four miles. I
8035 have never made any test of that. I didn't pay any attention to whether there was any particular rise or fall of the river within a week, two weeks or a month prior to the time when I ran these levels, nor did I pay any attention to the river to know. I just took the water in the river as I found it. I don't know whether there had been any rains prior to that time or not, nor whether there had been any higher water coming from farther west, from any cause, regardless of local rains. My recollection is, though, that there were no sand bars appearing at either bridge, which is usual, which made me think there was a little more water than usual, but the water wasn't deep.

Referring to Exhibit A–62, the line numbered 1 on the
8036 plat represents a line drawn at right angles to the river from the well which was 4⅛ miles north of the bridge at Mount Hope. I only sank the one well at the end of this line No. 1, and I didn't find any wells along line No. 1. I measured the water in the well at the end of line No. 1 the next day after taking the level of the water in the well which I spoke of as having been put down by the Colorado engineers, with which I compared my own well, and these wells which I compared together were about five feet apart. As to why I sank another well instead of taking the level of the water in the well that had already been sunk, I will say the water was in that well and I couldn't tell whether they had struck a hardpan bottom there and water had been poured in or not, so I dug a new well to see. As to the character of the soil around the well dug by the Colorado engineers, I will say, I know its
8037 character from my own well. The water came to the same level as the water in their well, and mine came from the ground, yes, sir. In running this line No. 1 at right angles with the river, I didn't have to cross the private property of farmers. I took my levels on the section lines and carried them across. Yes, sir, if one were sinking a line of wells at right angles from the river, that is, more than one, say a mile apart, they would fall upon the private lands of citizens, between this Colorado engineers' well I spoke of and a point on the river at right angles to the course of the river. They would be exactly a mile apart. Line No. 2, designated on Complainant's Exhibit A–62, is a line drawn at right angles to the river to meet the well which was dug at 2⅝ miles north of the Mount Hope bridge. No, sir, I didn't use the well there that had been used by the Colorado engineers; I dug one right alongside of it. Yes, sir, the water came to the level in the two. No, sir,
8038 not at once. We waited there, I expect half an hour. The line designated as No. 1 on Complainant's Exhibit A–62 is a line drawn at right angles to the river to meet the well which is

one and one-eighth miles north of the Mount Hope bridge, and I didn't use the Colorado engineers' well there but I dug new wells alongside of it. The line designated as No. 1 on Complainant's Exhibit A–62 is a line drawn at right angles to the river to meet the well which was bored at half a mile north of the river, and the figures "3.71," followed by the word "water" on Complainant's Exhibit A–62 on the north side of the river represent the elevation in the well which was 660 feet north of the bridge at Mount Hope.

Yes, sir, the lake I spoke of is designated on the exhibit as Patterson's lake. It is about three-quarters of a mile north and south and about half a mile east and west in size. I can't tell you
8039 how deep it is. I never measured it. It is not a deep lake. No, sir, it has no inlet or outlet that I know of. It is just simply a punch bowl or basin in the surface of the country, yes, sir.

As to whether in running on line No. 1 on the exhibit in a northeasterly direction there is any variation in the level of the surface of the ground from the river to the point designated by the figures "15.16," followed by the word "water," I will say it has a gradual rise from the river to that point, and the surface of the ground at the last point named is six feet above the surface of the water in the river at the end of the line. I can't answer the question as to whether there are depressions or ridges or divides between the point marked "15.16" and the river, or whether it is a gradual rise all the way from the river, because I didn't run the levels on that line. No, sir, I put down no wells on my line No. 1 at any point except on the end of the line farthest from the river so as to determine how deep I would have to go in the soil to reach water. Only that one.
8040 No, sir, I made no investigation which would permit of my stating whether or not the surface of the ground water bears any relation to the rise and fall of the surface of the ground overlying it. No, sir, I don't know from any investigations which I have ever made throughout this section of the country whether there is any marked correspondence or similarity between the surface of the ground water and the surface of the ground overlying it, and I am not in position to state whether or not the surface of the ground water rises with the rise of the surface of the land and falls with the fall of the surface of the land. The only levels I have run have been in the sandy soil. No, sir, I can't tell the difference in elevation between the point at the end of line No. 1 farthest from the river and the point at the other end of the line.

Yes, sir, taking the portion of the Arkansas river shown upon Complainant's Exhibit A–62, the ground rises as you go away from the river on each side. In other words, the river runs in a sort of depression. The ground rises as we go north and south from the river.
8041 Yes, sir, I said in answer to questions propounded by counsel for Kansas that if you would go up the river far enough you would always find a point which was higher than the level of

the water in the wells at the end of the lines designated on the exhibit as 1, 2, 3 and 4, and my notion was that the water in the river supplied the water in the ground at the points where the wells were sunk, but that it left the river at a point higher up the stream and not at right angles with the stream, yes, sir. Yes, sir, the water in running out from the river farther up to reach the point at the extreme end from the river of line No. 1 would not only be moving down hill with the general drop of the country, but it would all the time have to be contending against a side drop toward the river. There is no side fall at right angles. It will fall with the river. That was my statement. It would fall with the river. As I ex-

8042 plained, or tried to, the water that comes to this point will have to leave the river above here and will flow with this river and follow it. Yes, sir, if the water is going to come out at the extreme end of line No. 1 it has got to come from farther up the river, because one of the laws of nature provides that it will not run up hill, and another one provides that it will take, other things being equal, the course of least resistance or the greatest drop, certainly. No, sir, it is not a fact that the extreme end of line No. 1 is higher and that there is a direct fall from the extreme end of line No. 1 to the river at right angles from the river. No, sir, there is not any. On the surface of the ground there is six feet. That is, the ground water will flow toward the river, and the under-

8043 flow water will flow with the river there, from my notes, that I found. It will flow with it unless it meets with some stratum of sand or gumbo to turn it. Yes, sir, the river itself occupies the depression which at least is bounded by higher ground so far out as I ran the lines on either side of the river, as shown on this exhibit. Yes, sir, my notion is that instead of the water from the river flowing down the river through an invisible stream or underneath it that it pushes out under the soil some four miles back at an angle with the river and keeps on a level with it. It flows under that sand. It won't go under the river because it will go below the level of the water level then. I think there is water all

8044 below the river all the way, yes, sir. I think the sand here is about sixty feet deep. No, sir, I didn't make any observation in any of these wells as to the rise or fall of the water in them or as to whether it remained stationary. I never went back to them the second time.

The line designated as No. 6 on Complainant's Exhibit A–62 is a line that I ran at right angles to the river to meet a well bored three miles south of Mount Hope. Yes, sir, I sank that well. Yes, sir, the level of the water in that well was on a level with the water in the river at right angles. I haven't got the elevation of the surface of the ground at the river bank, or the elevation of the ground. Yes, sir, I can get the level of the water, and there is a difference of 28.05 feet between the surface of the ground, and the surface of the water at the bridge. Yes, sir, that is the difference

between the surface of the water at the end of the line and
8045 the surface of the water at the bridge. I dug this well 31.89 feet deep to water. The surface of the ground at the extreme end of line No. 6 as shown on Complainant's Exhibit A–62 is 26.03 feet higher than the surface of the water in the river at the other end of the line. No, I am unable from this data to tell just how deep I dug for water, if I understand these questions. I may have gotten mixed up here on your question on these two lines. As
8046 to how deep I dug for water at the extreme end of line No. 6, I will say 27.03 feet. Yes, sir, the level of the water at the extreme end of line No. 6 was on a level with the surface of the water in the river at the other end of it. No, sir, I didn't sink any wells along line No. 6 between the extreme end where I state I sank the well and the river. No, sir, I don't know whether the surface of the level of the ground water rises or falls with the rise or fall of the ground overlying that water between those two points. I didn't run the level over that line, so I couldn't tell you. There is a slough out half a mile south of the river. Yes, sir, it has
8047 water in it and had water in it at that time. The top of the water in that slough was lower than the water in the river. That slough has no name that I know of. No, sir, there were no divides or ridges between the slough and the river; it was a gradual decline.

In referring to the lines run as shown on Complainant's Exhibit A–63, I will say, from our starting point we found many instances in which the level of the water in the ground was considerably lower than the level of the water in the river. We ran on a line due north and south and the river has a northwest and southeast course. Yes, sir. we started from a point higher up the river. Running at right angles to the river, the ground rises as we go north or south from the river on each side along its course
8048 as shown on Exhibit A–63. Yes, sir, the surface drainage of the country is to the river from each side. The end line marked "1" upon Exhibit A–63 is about three and a half miles from the river at right angles, and the surface of the ground at the end of the line marked "1" is seven feet higher than the surface of the water in the river at the other end of the line, and we sank seven feet deep for water. No, sir, we did not sink any wells along the course of that line between the river and its extreme end where this well is located that I have spoken of. The surface of the ground between the river end and the other end of that line has a gradual slope. There are no sloughs and no ridges, and there are no sloughs between the wells which I sank on the south side of the river and the river, no, sir. No, sir, I didn't sink any intermediate wells on these lines between the end of the line farthest from the river and the river, and I know nothing as to the depth of the water under the surface from actual observation between the two points
8049 on any line. No, sir, I do not. And I do not know whether the water rises and falls in any of these holes from observa-

tion at any one time of the year as compared with another or one week as compared with another.

As to whether I was asked in this employment to take any levels as to the depth of the water in the wells on the places of Mr. Hansen, N. O. Huss, C. E. Tupper, D. E. Breese, Mr. Rutledge, J. W. Harrison, H. Jorgensen or any of those people who testified in regard to the water level in their localities when Kansas was putting in its testimony in chief last summer, I will say the Hansen well I believe was the only well that was designated by me and that is one that Mr. Carpenter had spoken of. As to whether I made any measurements of the wells or the water levels spoken of by these various people you have named, I will say it was directly north on a line from the bridge at Mount Hope and south of the bridge at Mount Hope and directly north of the bridge at Colwich and south of Colwich that I checked on, and that is all. If those others you speak of were on that line, I checked on all of the Colorado wells
8050 along that line. No, sir, not on their own wells. I didn't do that. And that was not part of my employment.

Redirect examination.

By Mr. ASHBAUGH:

As to the bed of the Little Arkansas river being above or below the bed of the Arkansas river at a corresponding point, I will state that in two places I have run levels connecting them, one at 13th street in Wichita, and I found the bed of the big Arkansas river eight and one-half feet above the bed of the Little Arkansas river. At Twenty-first street my recollection is that it is 13 feet above the bed of the Little river. These are practically corresponding points, yes, sir.

As to the time when I was directed to make these experiments, I will say, I know it was immediately after the return of counsel for Kansas from Colorado, and that was what fixed the time of the year for the making of these measurements, yes, sir. Yes, sir,
8051 Professor Carpenter's testimony was given on the 17th, 18th, 19th and 20th days of October, 1904, and I made these measurements the next month following. Yes, sir, when I made my measurements to determine the level of the water in the well as corresponding with the level of the water in the river at right angles, it was on the same day. We were two days in all. Now, I think north of the river we covered in one day and south of the river we covered in one day. It is my recollection it was all done on the same day. No, sir, we had no trouble in running a line from these extreme points away from the river to the river at right angles and keeping off of private property. We kept to the section lines. As to whether Professor Carpenter could have done the same thing if he had wished to do so (objection), why, it is all open there. He could, yes, sir. I know we did without any trouble.

8052 In the line directly north from the Mount Hope bridge and also from the Colwich bridge the land has a gradual slope from the river up. The land is a little uneven, but it is not bad. It is a little rolling. As to whether the water level actually followed the unevenness of the surface of the land, or whether the water levels at the different points are on a level with each other or on a grade with each other, I will say, on this line the water was on a grade. It was on a level on the right angle line and we had no intermediate points. As to how wide the drainage of the river is on each side before it begins to drain in the opposite direction, I
8053 couldn't tell you. I didn't run to the divide. I don't know just where the point is where the drainage begins toward the Little river, but there is a divide, when you reach it, from which the water drains into the Little Arkansas river; and that is also true of the Cowskin on the west. When I had reference this morning to the water flowing toward the river, what I had reference to in referring to the ground water was the surface water on top. As to where I found the sand sixty feet deep, I mean it is sixty feet to rock. This is only hearsay, as I get it from the water works company. (Objection.) And what I meant was that from my
8054 general information they struck rock here at sixty feet in depth. The levels of the water in the wells from Mount Hope that are marked are based upon a point at the bed of the river at the bridge at Mount Hope and at the bridge at Colwich, on a
8055 north and south line. In all the measurements I made I did not find that any variation or unevenness in the surface of the land had any effect upon the level of the water, to my knowledge.

Cross-examination.

By Mr. DAWSON:

As to whether or not it is true that if Professor Carpenter desired to sink the lines of wells as they were sunk and as I found them, say from five hundred to a thousand feet or half a mile or a mile apart, and keeping on a line one with another, if he had run at right angles to the river as to whether he would have been compelled in putting those wells down to trespass on private property or to sink some of them on private property, I would say, if he wanted to put them at an equal distance apart he would have to, but in going on that right angle line he would have crossed two or three section lines where he could have sunk some wells, but they would not have been
8056 equally distant apart. These section lines are all left open. They are on roads. All of these section lines or pretty nearly all of them are highways.

8057 F. M. STAMBACH, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Bentley, Eagle township, Sedgwick county, Kansas. I settled within a mile and a half of where Bentley now is in 1878 and have lived there continuously ever since. Yes, sir, I own land there. My south line is probably three quarters of a mile from the Arkansas river and my north line is just a mile south of the south
8058 line of Bentley. I have been acquainted with the Arkansas river since 1878. As to the Arkansas river as it flowed when I first knew it (objection), I will say when I first came here I think it was a pretty smart sort of a river, the way the water flowed in it. As to its width and depth and as to islands (objection), I will say there was only one island when I came here that was any way close to me. There are more now there, and the channel is filled up on each side. It is lots narrower than it used to be. These islands have increased in number and in size both, and a good many
8059 of them have grown over with trees, and the river channel has narrowed up. It looks to me like it is not more than two-thirds as wide as when I came here, if it is that. As to the depth, I don't think the channel is any deeper, if it is as deep. The river has been gradually filling up in the last ten or fifteen years.

As to the carrying capacity of the river at the present time to carry off the flood waters in comparison to what it was when I first knew the river, the water being at the same height as measured from the banks (objection), I will say the river don't carry nearly the water, and couldn't do it, that it used to. It is too narrow. As to how the flow for the last six or eight or ten years, exclusive of floods, has been in comparison with what the flow of the river was during the first years I knew it (objection), I have no dates
8060 as to when this river was dry. I never put them down. But I was here quite a while, seven years, before I knew that river to go dry. Since then it has gone dry—since the last ten years it has been dry several times.

As to what I know about the underflow in this country, I will say that I think I ought to know about it. As to how far back from the river the amount of water in the river affects the underflow (objection), I couldn't say how far back. I know it has an effect where I live. I can tell when the river is up or down by my cellars. The water comes in at the corner of my cellar. It is in there now. I can tell as quick as the river rises. Within a few hours the water will come up in the cellar, and when the water is down and the river low there is no water there. Local rains, I don't know that they ever put any water in my cellar. I don't think they
8061 did. This water that comes in my cellar comes from the ground, up from the bottom. It don't come in from the top,

no, sir. It rises up from the bottom, and that comes in shortly after the river rises and goes out shortly after the river goes down. Yes, sir, that has been true within the last few days. Yesterday morning there was no water in the cellar and this morning there was. The river has risen considerably within the last forty-eight hours. I don't know whether it has been two or three feet or not. Here yesterday we saw sand bars at the bridge and this morning it was running over them. As to how far I absolutely know that
8062 the condition of the water in the river affects the underflow, I will answer, now, I used to dig wells—when my father came to this country he settled south of Mount Hope. Mount Hope is two or three miles north of the parallel, and then he is two and a half miles south of Mount Hope and a mile west. I dug a well there for him when he first came to the country. That was in the beginning of the '80's. I dug that well for stock water, eight feet across and fifty deep, and we struck an underflow of water, a regular body of quicksand and water, and I walled it up, and there was water there for years. The whole country watered there. Then the water kept getting lower and it dried up in the well, and my youngest brother was there, and he dug, about thirty feet from that, a new well. He had to go sixty feet to get water, right just that close, but it was in quicksand. Now, whether that is an underflow from the river or not, I don't know, but it is sheet water. As to whether that water rises or falls at different times, I couldn't say for I didn't live there. I just dug the well. I have all drove wells where I live at Bentley.

I couldn't speak as to the other wells or cellars, as to how far
8063 back the underflow affects them. (Objection.) I never paid any attention only to this well of my father's. This cellar of mine is probably a mile and a half from the river at the nearest point—the cellar I referred to as having water in it this morning. As to how far back I have noticed the presence of the underflow affecting crops (objection), I know that particularly in the dry season when there is no water in the river, hardly, our bottom there, that always raised good corn, because we wouldn't have
8064 to go very far for water, and the corn got its moisture from the sub-irrigation. It extends quite a ways back, probably—well, from where I live pretty nearly to Halstead, and that would be about eight miles, I guess. Halstead is right on the bank of the Little river, and it must be ten miles or something like that from the Arkansas river. As to their raising corn there when they didn't raise corn on the uplands, I will say I have hauled corn to Sedgwick when the upland men didn't have a peck to the acre. It dried up. They didn't have any corn.

Cross-examination.

By Mr. Dawson:

Where I have sunk this well on my father's place it was quite a high place. I couldn't tell how far it is above the river. I

8065 have no idea. At that well where I dug there it is fifty feet deep. Take it down below Mount Hope, they strike water at five or six or seven feet, so that would make about the difference. We always supposed it was fed from the underflow of the river. No, sir, we never ran any levels to see whether the water level differed in the same manner. Probably it took five or six or ten hours, something like that, for a rise in the river to affect my cellar. No, sir, there are no sloughs or creeks or anything that run by my place or house. Yes, sir, I live on this delta or piece of land between the Arkansas river and the Little Arkansas river. As to whether the Arkansas river was dry about Bentley and down as far as the mouth of the Little Arkansas river in the summer and fall of 1879, I would say I haven't any dates when it went dry, but it went dry I think one or two seasons after I came here, but the last six or eight years I don't know the dates.

8066 C. W. WATZ, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Wichita, Kansas, and have lived here since 1876. I used to live in the east part of the town and now I live in the south part. I now live on the west side of the river.

Yes, sir, I have had experience in the different places I have lived with water getting into my cellars, and as to how many places, I might say in both places, on the east side and on the west side. They have cellars down there and they get water in them every time the river rises. The first place I lived was about a mile and a half from the river. I lived within a block of Hydraulic avenue,
8067 and from Hydraulic avenue to Lawrence is a mile. As to my experience with water getting into my cellars (objections) I will answer it always got in them when the river rose, and it does over on the west side. I lived at the first place in Wichita about 18 years, from 1876. It was not quite six feet to water at that place. I had my house banked up on the outside. The water got into that cellar every time when the river rose and disappeared from the cellar when the river would go down. It came right up from the bottom, from what is known as the underflow, and that was a mile
8068 and a half from the river. No, sir, I was not able to stop the water getting into my cellar. It would come within two or three feet of the top of the ground. The next place I lived I should judge was about two and a half miles from the river. I had no cellar there, but my neighbors had cellars and it came right up from the bottom into their cellars every time the river would rise (objection) and would go down when the river disappeared. Yes, sir, the water would come and go in accor-ance with the flow of the water in the river. I lived four years in that neighborhood and then I moved to the west side of the river and have lived there now two

years. I have a cellar there. The water comes right up
8069 through the bottom in that cellar. My cellar is cemented.
I have it all cemented around the sides and also the bottom and it came right up and bursted through the bottom of the cellar and raised the cement and cracked it and came right up through there and I cut a hole then in one corner and let the water out. When the river goes down the water goes down there. Before I cut that hole the water would go out of the cellar, but not as fast as it does now. It was only a small crack that let the water come up through. You could see it coming up through the crack in the cement. No, sir, that water did not come from the surface after a heavy rainfall. I don't care how it runs it never gets water in it unless the river rises, and just as surely as the
river rises it comes up in the cellar, and just as surely as the
8070 river goes down it goes down. (Objection.) I have about
eight or ten inches of water in my cellar now, and that came in since the river rose, and that is three quarters of a mile from the river. Yes, sir, I know of neighbors around there having similar experiences. My nearest neighbor there has a cellar right next, and he has water—I don't know just now whether it has water in it or not, but last year it was nearly half full of water.

Cross-examination.

By Mr. DAWSON:

Yes, last summer and fall, in August and September, I lived at
320 Dodge avenue, Wichita.
8071 As to when I was first talked with in reference to this case
and in reference to what I knew about water in the cellar, I will say I haven't had a talk with anybody, in fact I didn't know I was going to be a witness here at all. I came here to hear the case. Yes, sir, I came up with Mr. Silas Rutledge. No, sir, he never suggested to me to be a witness or anything of the kind, to my knowledge. As to where he found me to bring me up, I will say he lives right close neighbor to me. He wanted to know if I wasn't going up to-day to hear the trial, and I came over, but didn't know that I was going to be a witness in the case.

As to how long after the river gets up before it will show water in my cellar that was a mile and a half from the river, I would say, it wouldn't take it very long. If the river gets up it is in there, in my judgment, in from about six to eight hours, if it gets high enough. As to whether I am on higher or lower ground than Douglas avenue along here in the business part of the city, I would say I am
away up higher. I think they claim it is eight feet higher
8072 than Lawrence avenue. I am on the highest part of the
ground on the west side. As to how much I think I am above the river channel, well, I couldn't say. I hardly know. I never took any survey of it. As to whether I am as much as ten or twelve feet above the water in the river when it flows like it is

now, I will say, I don't think so. Douglas avenue is above the water in the river, yes, sir. My cellar is about six and a half feet deep. No, I don't think I am as much as ten or twelve feet above the water in the river when it flows like it is now. If I am eight feet above Douglas avenue, as to how much I think I am above the river, I would say I don't know. You know the river—the west side is away higher than this side is. The slope runs this way, east, all the time. I don't know how much higher my cellar is than the water in the river. I should judge it was seven or eight
feet higher than the river is, that is, in its low stage. Last
8073 year when the river was up there was over two feet of water
in my cellar. I don't know that I am eight feet higher than Lawrence avenue down here. I don't say that to be the fact, but that is what I should judge, and that is what they tell me, men that know or have taken a survey of it or something of that kind. Yes, sir, there is water in my cellar this morning. I am farther away from the river, I should judge, than the corner of Lawrence and Douglas. Yes, sir, I know they are sinking a basement for a building over here on the corner of Lawrence and Douglas avenues. No, that basement is not four or five feet deep, I don't think, below the level of the ground. I know they are down to water all the same. As to how much there is in the bottom, whether an inch or two, I
will say I don't know. I haven't been down there for several
8074 days, but I know I have seen water in the bottom of it.
There was *was* not much, no, but the river was down then. As to whether the river has been flowing a good stream for the last six weeks, I will say, well, at times, at short intervals.

8075 H. H. HANSEN, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I am the same H. H. Hansen who testified in this case in chief. I know the location of the lands of John A. Williams. As to how far along the river bank his lands extend, I would say I don't know. I have some idea, though. I should judge about ten miles. He has six and a half miles on the north side of the river and one
mile on the south side of the river, by section lines. This is
8076 about twenty miles northwest of the city of Wichita. Mr.
Williams owns that much of first bottom lands—ten miles, or whatever it may be, on the river. He owns all the bottom land along the river adjoining there. Taking his land as a whole, it is pretty low. As to how low it is in comparison with the average flow of the water in the river, well, if the river is bank full, without floods, he has got a lot of land under water. As to how much of his land overflows when the river is bank full (objection), I am not able to say, but there is a good deal of it. Whether that is from the underflow or an overflow, he has got ponds a good ways back from

the river. I am not prepared to say that it comes from the river. I don't believe it does, but it is the underflow that raises those
8077 ponds. Those ponds vary in distance from the river. One of them that I am well acquainted with is a mile and three quarters from the river. To make a rough guess at it I should think there is at least a thousand acres of Mr. Williams' land that would not do to plough up under any circumstances because it is too low and wet. As to whether there is any made land along the river bank along by Mr. Williams' land, I am not prepared to say that, because the river, or such a length of it as he owns, where he gained probably in some places he was washed out in other places. I am not prepared to say what made land he has. He undoubtedly has made land, because the river is so much narrower. Yes, sir, the river is narrower all the way up as far as I am acquainted
8078 with it, and narrower than it was ten or fifteen years ago. (Objection.) I know the lands that used to be known as Chris. Moore's land. It belongs to Mr. Williams now. As to whether there is made land along that tract, I am not prepared to say because I am not a hunter or a fisher and don't go down to the river very much. I know there is a pond of about a hundred acres in it, a low spot that is in a wet season all over water. That is all I know about it. As to Mr. Williams' land last year during the flood in July, the river never came out of its bank last year there, and I
8079 couldn't say. That is a big ranch and I don't get there very often. Mr. Williams' land along the river is best suited for grazing and hay lands. On the average, his lands are so low that they are often very wet for that purpose. (Objection.) As to how far back from the river I know the underflow extends, I will say, that varies some. As far as I know, that depends upon the underlay of the ground. Where the ground is high and is underlaid the underflow has nothing to do with the raising of crops. Now,
8080 we know that the underflow is as far north—on the south side I am not acquainted—but it is as far north—at Burrton I think it must be about eight or ten miles, and there is a little creek starting at Burrton, what we call the Kissaway, and the underflow has an effect on the crops between the Big river and the creek. This creek, the Kissaway, is at places from six to ten miles from the river, where the underflow has an effect upon the crops. I don't know of my own knowledge of any other places. Of course I have my opinion. As to how far back I live from the river, it is two and a half miles from the river, and the underflow comes back that far.

Cross-examination.

By Mr. DAWSON:

8081 Mr. Williams lives there not far from me, about two miles. I don't know that he testified on account of his own land. I know he has been here and testified. I don't know whether he is here to-day. I haven't seen him. As to whether Mr. Silas Rut-

ledge has a written statement of what I am supposed to know, a memorandum, I don't know whether he has or not. He asked me some questions. Whether he has a little statement or not I don't know. I didn't see him put it down.

When I was here last summer and fall and testified I said I would bring a memorandum of crops, yes, sir. No, sir, I haven't
8082 got it. Of course I have hunted for it and hundted for it, but when I moved it was lost. I haven't got it at this time. I couldn't find it after I came back from here, and I can't get it, no.

8083 RUFUS CONE, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived continuously in Wichita since 1878. I was in the grocery business first, and am in the laundry business now, and have been sheriff of Sedgwick county four years, and I was con-
8084 stable in the city for five years. During that time I expect I crossed the Arkansas river on an average of once a day, or nearly so anyhow. As to the Arkansas river as I knew it when I came here first, as to its width, its banks, its channel and flow of water (objection), I will say I know at one time the river here at Wichita was—I think the bridge was three hundred feet longer than it is now. I think they took out three spans, 100 feet to each span. As to the river being wider all through the county than it is now, I can't say as to that. I remember these little islands that used
8085 to form in the river here with no trees on them, and when those islands that are up and down the river now had no trees on them they would form in there one year and wash out the next. I have noticed these islands forming now and when they form there they are there to stay and grow up to a thick growth of timber and brush.

As to the carrying capacity of the river now compared with what it was in the early years, the water being at the same height as measured from the banks (objection), I will say until the last few years since we have had extremely high water and during high water seasons there is not the water in the river that there was in the early years, in my opinion.

8086 As to the flow of the river, exclusive of floods, in the last ten years compared now with what it was when I knew it first for ten years, I will say there is not near the volume of water. As to the underflow in the Arkansas valley, I will answer, I was here when they made a test right where the Federal building stands now, if I remember right. Yes, sir, the underflow extended back from the river as far as the Federal building at that time. My experience has been that the amount of water in the river influences the underflow all through this valley—all through the lower bot-

toms here. As to what experience I have had, well, before we had a sewer system here, in cess-pools and water closets during high water I have seen the water rise up to the top of the ground at a time when we had no rain. It would come up from the bottom, especially those that had been dug down deep enough to reach the sand. In places you would have to go only three or four feet to the sand, and during the continued high water in the river for a few days the water would rise in those cess-pools. When the
8087 water in the river would go down the water would disappear in the cess-pools. I have noticed that condition existing as far back from the river as St. Francis street, which is about three quarters of a mile from the river.

Cross-examination.

By Mr. DAWSON:

As to what I call a flood period—this good flow that we have in May or June or whether I mean a big flood like that of last year—I will say, I call that last year a flood, but this is not. We have had high water this spring. As to whether I mean the same thing by "flood" as I do by "high water," I would say, high water, yes, sir. No, sir, it don't necessarily mean in my mind a flood that
8088 overruns the country. I mean a good, strong flow of the river. Yes, sir, when the river is up the water will now come up in the basements here in Wichita. Whether the narrowing of the river of which I testified is limited to where I have been in the habit of crossing the river, I will say, yes, sir, but at one time here we thought this river was navigable, that we could run steamboats from here to Arkansas City, and we got an appropriation to clean out the snags. There has nobody been crazy enough to think we could run boats on that river in the last ten years. No, sir, there never was any commerce carried on on the stream at any time up this far.

Yes, sir, I limited my answer to counsel to the place where I generally cross the river, and that is anywhere within a radius of eight or ten miles from Wichita around. Yes, sir, one place I
8089 crossed was at the Douglas Avenue bridge. Yes, sir, the river has been narrowed there artificially to the extent of about three or four hundred feet by the filling in of dirt and stuff. As to there being buildings now constructed on what used to be a part of the river, I would say the water got so low here and so little water in the river, that they had no need for this bridge and they went to tearing it out, span after span. Yes, sir, there are buildings now constructed on what used to be a part of the river.

Redirect examination.

By Mr. LOOMIS:

Yes, sir, the river has naturally narrowed up in the first place on account of the small volume of water running in it. That is right.

And the portion of what had formerly been the bed of the
8090 river was no longer needed and it filled up by this narrowing process. (Objection). Yes, the river narrowed down, of course. They didn't pull out this span from the river. The river narrowed down and they pulled out a span of the bridge, and took it out because the span became useless, and it is my understanding that they pulled the spans of the bridge out as the river narrowed up by natural causes. That is why they pulled them out. (Objection.) This was merely following the narrowing of the river.

8092 G. T. CUBBON, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in the north end of the city of Wichita, and have lived here seventeen years, and am now chief of police of the city. I have been acquainted with the Arkansas river during the time I have
8093 lived in the city. As to the changes I have noticed in the appearance of the river (objection), I have noticed that the river is filling up and the islands are getting larger—the small islands you will find along in the Little and Big Arkansas rivers—and consequently it cuts off the carrying capacity of the stream. As to the carrying capacity of the Arkansas river now as compared with what it was when I knew the river first, the water being at the same height as judged by the banks (objection), when I came here seventeen years ago the water that would now overflow the city would then probably not be much more than out of the banks, and the carrying capacity has decreased materially. (Objection.) As to what has caused the decrease in carrying capac-
8094 ity (objection), in my judgment it would be on account of the decrease in the water passing through the river. As to how the loss of water passing down the river has caused this decrease in its carrying capacity (objection), I will say, you take a stream with a large flow of water, it naturally washes out the bottom and keeps the grade down always, but you cut off your supply of water and it will keep settling and gathering there and doesn't wash out. And this has been the condition of the Arkansas river for the last ten or fifteen years. I know a place now in the river where we used to go in swimming and couldn't find bottom to it. Now you can wade out in the summer here—well, the same amount of water, even, flowing there at that particular time of the year, it would go away up on the banks, and the depth of water that we used to have now you can wade through it. If the same amount of water should now come down the Arkansas river that came down in the early days which then just filled the channel to its banks, it would now overflow the lands in the city of Wichita.

Cross-examination.

By Mr. DAWSON:

8095 In addition to being chief of police, I have been a member of the city council here, and I have been actively engaged in local politics in Wichita about 17 years. I am a Republican in politics. As to my having been in the habit of working together with counsel for Kansas in local political matters, I will say I don't believe we have both been working together, any more than we are both Republicans. We have never been closely affiliated in any way. As to where I was during last August and September when the hearing was on in this case in this building in Wichita, I
8096 will say I was in the city here. As to whether anything was said to me at that time about being a witness in this case, I don't think there was at that time. I was in business here—I was chief of police. I went out of office four years ago and came in again this spring. As to its being a fact that this is a river of changing channels and that you might find a hole to-day where there would be a sand bar next week, and the reverse, sometimes, of course there is a difference in the water flowing down the river, but take it at the same time of the year and apparently the same amount of water, it runs away up on our banks when before that it was down and we had deep places in
8097 the stream that are now filled up. As to whether the mere fact that the swimming hole does not exist to-day where it used to, to which I referred, is not in itself any evidence in my mind that there has been a change in the volume of the water in the river, I would say, not of itself, probably. I couldn't say that the channel of the river had as good a carrying capacity in 1877 as it had when I first knew it. I came here in 1888. As to my knowing as a matter of local history that the river here overflowed a good part of the city of Wichita in 1877, I will say, I have heard of it. I came here in the spring of 1888, yes, sir. As to whether that was the time that the river commenced to narrow or some time later, I will say, I noticed it at that time. I lived right up near the bank there and used to swim and fish and hunt and drive up the river. I didn't notice it quite so much when I first came here as for the last ten or twelve years. It has been more perceptible since then. As to whether anybody has recently suggested to me when it was that Colorado commenced to take out large irrigating ditches and go into irrigating on a large scale, I will say no. A year or two ago, probably, I read it, but nobody has suggested anything of the kind to me.

8098 Yes, sir, the river has been narrowed some here at the Douglas Avenue bridge, artificially, since I came here, by filling in. I think piles were driven out along the river and it was filled in back of those. Yes, sir, I think that is a fact. As to there having been quite a little complaint among the people here about narrowing up the river and interfering with the flow of it in this locality, I have heard such complaints, yes, sir.

Redirect examination.

By Mr. ASHBAUGH:

Complaint has been made inside of the corporate limits here, and also I have heard it suggested and spoken of that below and above the city here it is the same thing. As to why you can't drain the Little river into the Big river at a corresponding point across above the city, it is probably because the Big river is higher than the Little river.

8100 JOSEPH G. McCOY, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Wichita, Kansas, and have lived here since 1881
8101 I was here myself prior to that time. I saw the Arkansas river first about June, 1871, about thirty or forty miles above here. At that time I was going with a party of directors and owners of the Atchison, Topeka & Santa Fe Railroad Company. They were taking a trip up the Arkansas river so as to determine whether or not they would extend their line of road beyond the town of Newton. In 1867 I came first to Kansas and located at Abilene, about 90 miles north of this, and put in a cattle shipping depot and established a trail from there through to Texas, coming down through this country and crossing the river here at Wichita, and it was extended finally to Corpus Christi, Texas, and I was in contact right along then for a succession of years with the men who brought the cattle up over that trail. There were no trails in existence at that time for
8102 the purpose of driving Texas cattle, and this was the first trail established along that line and it crossed the river here at Wichita. It crossed the river below the west end of the Douglas Avenue bridge, perhaps two hundred yards lower down. It angled in a northeasterly direction so as to come out and strike the land right at the east end of the bridge. The trees that I refer to are out west and beyond the present bank—those large
8103 trees—and not less than a hundred yards from the west bank of the river now. They were large cottonwood trees. There were occasional cottonwood trees strung pretty well all along down the river and on the north side of the bridge there was, quite a little distance up the river, but I believe on the south side there was merely scattering timber at that time. I came down to Wichita and saw the river here in 1872, and I was in contact with it more or less every year until I finally moved here. We made our shipping point here. When settlements closed up the country so that they couldn't go into Abilene, then the cattle were loaded
8104 here, in 1872 and 1873. From 1868 when I came to Abilene until in the '70's, I was acquainted with Mr. T. C. Henry at Abilene. I was the cause of his coming to Kansas.

As to the river from the time I saw it first for ten or fifteen years after that, I will say, the river all along those years was a wider and a greater river than it is now. (Objection.) It was a river that gave the stock men a great deal of trouble on account of having to swim their stock across it, and we did swim the stock across in the early '70's right along from the very beginning, the opening of the trail, and in 1872 their stock swam this river right here.

8105 As to the time of the year when we would swim the river, the cattle would begin to arrive from Texas in the latter part of May and from that time on, generally speaking, for two months the river was flushed and flooded and the herds had to swim. In the fall of the year there was not so great a river, that is, there was not so much water flowing in it, although it was a very considerable river.

Examining Complainant's Exhibit A–52, I will say that it is a reprint of a sketch made here on the grounds by Professor Henry A. Worrel of Topeka, made in 1872, at a point near Wichita here, and is a fair and correct specimen of the manner in which the herds crossed the river in those days. He made the sketch on the bank of the river here, without expecting it to be ever used, and this illustration is made from his sketch. It is a reproduction. Yes, sir, it was published in a book printed in the winter of 1873–4. The manuscript was prepared by myself in 1873 and the publication was made that winter, entitled "Historic Sketches of the Cattle

8106 Trade of the West and Southwest." Yes, that book was written by me, and this photograph was made from that drawing, which is a true illustration of a natural event.

As to Ackerman's island (objection), I will say, well, this island known here as Ackerman's island was not—I have no memory of any island being there, only a sand bar. Other islands up and down the river have grown in number and size since those early days. They have grown very considerably, so as to have become islands with timber and trees on them, and before that they were only sand bars without trees.

8107 As to the carrying capacity of the river now compared with it in the early days, the water being considered the same height as measured from the banks (objection), I will say the carrying capacity is less. The river has narrowed and filled in more or less with islands. As to how far this condition extends above and below Wichita, I will say, my knowledge of it would extend fifteen or sixteen miles up and down the river either way.

As to the flow of the river during the last ten years as compared with the average flow during the first ten or twenty years I knew it (objection), I will say I don't think it is so great now as it was then.

Cross-examination.

By Mr. DAWSON:

8108 Yes, sir, if you were crossing cattle here at Wichita now, in June, 1905, or in May, 1905, you would have to swim them, probably, for a short distance.

I don't think the river has been narrowed here at the Douglas Avenue bridge, artificially, by more than 300 feet, if as much.

8109 M. E. MORGAN, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live at 517 West Harry street, Wichita. My house is within 215 feet of the river bank, and is the nearest house to the river. I have lived there eight years. I came to Sedgwick county on the 4th day of September, 1876, and have lived in Sedgwick county ever since. The first 29 years I lived on or very close to the banks of the Arkansas river, about seven miles below Wichita, on
8110 the south side of the river. The first years after I lived here we used to go around and cross the Douglas avenue bridge; then we would cross the Lawrence avenue bridge, which is a bridge across the Arkansas river at an extension of Lawrence avenue south of Wichita. There were no other bridges until recently. This Hydraulic avenue is one mile east of Lawrence avenue and runs north and south parallel with it. They are the section lines.

8111 As to how familiar I have been with the Arkansas river from Wichita south for ten miles for the last 29 years, I will say that I was pretty familiar with it, for I have travelled up and down a great deal. I raised truck when I lived out in the country and was in Wichita during the summer season every day, during the market season, so that I travelled it pretty often. Yes, sir, I remember the old wooden bridge. I paid seventy-five cents to cross it the first time I ever crossed it. I ought to remember it. As to the river during those early years along the ten miles that I knew it (objection), I will say, as near as I can remember—and I can remember tolerably well for a man of my age—it was pretty much clear of any obstructions in the stream, except in three places between here and what they call Derby. There were three islands between here and there and they were the only ones in that distance, and now I think there are seven all told, where there was only three then, and the river was then, I should say, from
8112 150 to 300 feet wider than it is now. As to it having filled in so as to narrow the banks (objection), it seems as though there has been trash coming down in time of high water and sometimes a log would butt into the bank. Then here at this bridge there has been filling in done by the inhabitants to some extent. That has narrowed the channel here, although it has filled in gradually from

where it had narrowed in, to form a slope like, and in forming a slope the water, when it got turned, would get into the opposite bank and tear out a chunk, and small cottonwood trees, and you would *would* see them rolling down the river, and when the water would be down they would be sticking in the sand. It wouldn't be but be a short time until there would be a sort of a little tuft or what we would call an imitation island formed, until those little islands would be formed all along the river. I couldn't give you the year when Lawrence avenue was bridged, but at that time there was no island where the bridge crosses the river, and now
8113 there is a pretty good size island there that is all grown up with cottonwoods and willows. I should judge those trees are from eight to ten inches through. That island commenced forming by catching brush in the piling of the bridge and then the sand washing in first started an island after the bridge was built. It has formed quite an island there. Yes, sir, right along in town here there was an island in the river, a wide portion of the river being on one side and a narrow portion of it on the other, and that place 29 years ago was called Dutch Joe's island. It was
8114 then a regular island in the river, with a stream next to the main bank, so that it made a straight island all right, and the water was deep enough so that you would have to swim a horse when there was any water in the river. Now right where that stream ran around that island it is all filled in and connected with the main land so that there is no stream there on the west side of it. That place is directly west from my house, and I can see it from my house. I am within about four hundred feet of it. As to what caused that western portion of the river to fill up, the first time I noticed it in time of high water there was a lot of brush and trash came down and gathered at the north end of the channel and from that it kept filling in gradually. It would form a sand bar
8115 wherever brush caught in, and then the water running over washed the sand over and it filled in that way gradually. In the bed on the west side of that island it is pretty much all covered with trees now. The river right at my home here (objection) I should judge to be about three hundred feet wide. These changes that I have described have come about within the last fifteen
8116 years. As to whether the river receded before the filling in or whether the filling began before the river had receded (objection), I will say it has been gradually filled in by the inhabitants for probably fifteen or sixteen years, by people building out into the river. I mean filled out, by driving piling, etc., and filling it with manure and narrowing it up. When I crossed I think the bridge was somewhere from two to three hundred feet longer than it is now, and if the same amount of water ran in the river now that used to run in the river then, the city would be under water a good deal of the time in the course of a year, because it couldn't get through the channel. Yes, sir, the water had gone down be-
8117 fore the time when the river was filled in. Yes, sir, they

simply occupy the part of the river that the river had left after it had receded. As the sand formed a bar up the shore they commenced driving piling along at the edge of this and filling in dirt and manure. When that was done the next thing the sand would come up over that and they would then drive some piling or something to fill it out a little further. They kept filling in
8118 in that way as the river went from the bank and drawing it more into the channel and it kept filling in. Now, that is the way I noticed it.

As to the flow of the river, exclusive of floods, for the last ten years as compared to the flow for an equal number of years during the first periods I knew ft (objection), well, the flow of the river is not as large as it used to be in former years. I can answer that question very easily. There don't begin to be the flow. There is not half the flow. It is somewhere in the neighborhood of fifteen years since I noticed the flow of the river to have been materially decreased.

Cross-examination.

By Mr. DAWSON:

8119 Yes, sir, I heard when it was that Colorado commenced to take water largely for irrigation, I have not heard any statement as I know of in regard to irrigation in several years. I couldn't give you any definite idea. No, sir, I haven't talked it over with anybody recently as to the time when Colorado commenced to irrigate largely. I have not seen the men who are interested in this suit. The way I happened to get up here, I suppose, was by seeing and talking with counsel for Kansas, and we were talking then about a place where I lived in Michigan with a kind of curious name for a little town, and in talking the matter over about that little town and other conversation it led to the subject of the river, and that was all that was said, any more than counsel asked me how long I had lived here. I told him I lived in Kansas nearly thirty years. This conversation I think took place about two weeks ago or more. It was not last summer, no, sir. It was this spring some time. I was living right here in Wichita last August
8120 and September. I have lived here for eight years, pretty nearly that. I moved here seven years ago last August. I was notified by a letter to come up here as a witness. No, sir, I was not up here last August or September. I have not been before the examining board at all in any way before. He notified me to come, and that is all there was of it. He asked me how long I had been a resident of the State, and I told him I had lived right on the banks of the river for nearly thirty years. That is all the conversation we had in regard to the matter.

Flood periods, as I understand them, and what I mean, is when we have a time like we have had within the last few weeks, of ex-

tremely high water, when the river is running a good, strong
8121 stream, yes, sir. No, that don't necessarily mean it is out of its banks, really, and still it does. I understand that when a river or creek becomes flooded it is caused by having more water trying to pass through it than it is capable of holding. Yes, sir, when I am asked to exclude flood periods I exclude the high water like we have had for the last three or four weeks here, as well as when the water overflows its banks, because I don't think that has reference to anything in regard to the natural flow of the river. High water has nothing to do with the natural flow of the river. Yes, sir, we used to have a period of high water along in May and June in the early years, and I excluded those when I made the comparison. I just took the river in its natural form, and by that I mean when it is running without any additional water
8122 from any source. As to how much of a stream that makes when it is running that way, I would say, I have crossed it here when it would run into the wagon box. That is when it was in its natural form, right in the middle of the summer. No, sir, it wouldn't be up to the wagon box all the way across the stream. It would be in the channels where it was that deep, and you would hear your wagon chatter along through the quicksand.

Yes, sir, I spoke about this island being attached to the main land, called Preacher Joe's Island, and I said that when the water was running a good stream it would often swim a horse between the narrow channel and the land. That was on the west side. No I don't think there were any times when there was not running water. When it was running in times of high water it would run on the other side, and that would answer the question, but at all times of the year when the river was up at all there was a
8123 small channel running on the west side. Yes, sir, there was always some water there. So far as any body claiming this island as a part of their main land after it became attached, I would say I don't know. That is out of my business. There has never been any dispute or anything of the like of that that I know of between the party owning the main land and the party owning the island. There is a little side channel—there is no water running in it unless the water gets extremely high. There is a little side channel between the main land and the river that the grass grows on. No, sir, nobody helped to bring about the closing up of that channel. It closed up as a natural consequence.

I landed in Wichita the 4th day of September, 1876. As to the river being practically dry above the mouth of the Little Arkansas river in 1879, I don't think it has ever been practi-
8124 cally dry since I have been in Kansas. Never as near as at the present time. Well, now, I will not say that. But I was going to say it. But a week ago it was not as high as it used to be naturally through the whole center, except the two floods.

No, sir, there has not been a good, strong stream flowing down this river for nearly ten months last past. I live right there where

I see it. My boys, three and a half or four feet tall, just wade back and forth right through by my place. It has been stated through the papers that the flow of the river here for the last ten months has been remarkably good as compared with quite a period of years before, but I have failed to see it, living right on the banks of it. Now, that is my straight answer. If it be a fact that the flow of the river at points immediately up the river from here, such as Hutchinson, Great Bend, Larned, Kinsley and Dodge, has been as good or better on the average for the past ten months than any ten months in the last twenty or twenty-five years, as to how I account for it that it don't appear at my place, I will say, well, now, if there is any person that makes any such statement as that, I want to make one little statement. If there is any person that makes such a statement as that you can tell them for me that they make a false assertion;
that I have lived right there and see the water run and know
8125 how it runs exactly as well as they can state it in their papers. I don't believe it has been that way, because I have lived right there on the banks. Yes, sir, I keep a gauge or measurement of the run of the river. I have only a gauge I made myself there. No, sir, I have not the record I kept from day to day, and I didn't furnish it to counsel for Kansas. I furnished him nothing at all. As to what has been my purpose in making these daily readings of the river by this gauge, I will say, well, I can tell you just exactly how that is. Last spring the "Eagle" came out with a great long lingo about the river being four feet higher than it was before in thirty years. Well, I have lived right there and knew better when it came out in the paper, and told my family, I says "That is done for a purpose. The Eagle has published that for a purpose, for," I says to my wife, "you know very well the river was not as high within two feet, or a foot anyhow, last spring as it was
in 1877. There was not as much water in it by a foot as in
8126 1877." I don't know anything about the Wichita Eagle having been a very active supporter of this suit of Kansas against Colorado. I take the Daily Eagle but don't know as it has supported either party very rabidly. I don't know anything about its editor being one of the chief witnesses in the case and having claimed to one of the originators of these proceedings.

As to what has been my business for the last twenty or twenty-five years, I will say, when I first came to Kansas I went on a farm. I raised garden truck and sold it in town—peddled it out. I don't know whether it is best to brag or not, but I have taken more premiums on garden stuff and farm products than any other one man
in Sedgwick county when I lived on a farm. That is what I
8127 have been doing. I have been farming for the last eight years. My land runs to the bank of the river. I have only a very small amount now. I have fourteen lots of city property. Yes, sir, I have a well or opening on my land there. As to how the water level down there compares now with what it was in the earlier times, I will say, my pump is right down close to the river there.

It is down 36 feet right there by the river. The water level where you first strike it when you fig in the ground is about the same now as in the early days. Well, no, it is not the same quite. I was just thinking. My first pump I drove down about six feet before I struck water and the last one I drove down, that was three years ago, I drove it down almost nine feet before striking water. As to whether that was a very dry year, three years ago, I would say the water seemed to be about the same in the river as now, that is, its normal flow now is just about the same. It may be lower
8128 now in its natural flow. Not now it isn't, because now it is above that. As to whether three years ago was not a very dry year as far as rainfall was concerned, I don't just remember about that, but I rather think not. As to whether the river ever goes dry opposite my place entirely, oh, there is always some water in the channel. The bed of the river has filled up more in later years. The water is shallower, really, when it is where it should be. It is shallower on the bed of the river than it used to be. The bed is higher. I was digging down last fall—I wanted to get a little bit of coarse sand, and I dug down so that the sand in the old bed of the river was about 10 to 12 inches deep. The bed has filled
8129 up ten or twelve inches within the last six or eight years. My well is about 200 feet from the river. As to whether the river when it is full or low affects the water in my well, I will say, no, sir, I am below the river. I am below the first stratum of water. I don't know how it affects the level of the water in the ground where I first strike water. I have not had my pump out since I put it down. If the bed of the river is higher than it used to be, as to how I would account for the fact that when I sunk my well the last time I had to go deeper for water two hundred feet from the river, I couldn't account for it in any other way than the upper floor of water, as we used to call it when I came to Kansas, is pretty much cut off. The first stratum of water. That came from the river a good deal. Yes, sir, there has always been water in the river
8130 since I have been here, a small amount. No, sir, I couldn't tell you how the average rainfall for the last ten years has compared with the average rainfall in the earlier years. I keep no track of that at all.

As to how long I have been keeping this measurement of the river down there with the gauge, I put that in three years ago this spring, on account of there being so much dispute about the rise of the river here. It came out in the papers that there was going to be so much of a rise and so much of a fall. As to my saying that I put it down last spring after the "Eagle" came out, I will say I did. It was three or four years ago. They had advertised there was so much of a rise coming and you would hardly notice it.

Redirect examination.

By Mr. ASHBAUGH:

8131 The flow of the river for the last ten months has been very uneven. Yes, sir, last fall in the months of September, October and November the water was very low. Yes, sir, I said that the flood of 1904 below the city did not reach quite the same height as the flood of 1877.

I was here in Wichita last August and September and was in a fair state of health for a man of my age during those months.

8132 FRANK BRIDGEMAN, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live at Bentley, Kansas, which is about two and a half miles from the Arkansas river, and I have lived there eight or nine
8133 years. Prior to that time I lived up between there and Hutchinson. I came to Burrton in 1874. The first time I ever saw the Arkansas river was on the 5th day of July, 1874. We had some folks there and we went to the Big river to see some sand plumbs, and from that time I have lived within three or four miles of the river, ever since. At that time I was quite a boy. I didn't pay much attention to the river until 1889. That was the year I was married, and I rented a farm right on the banks of the river. I farmed there that year. That farm was in the northwest part of Sedgwick county, and I was then right across in Reno county. It was three and a half miles north of Mount Hope and about two miles west, on the north bank of the river. There was about half a section of that land, and probably eighty or a hundred acres of farming land and the balance pasture.

8134 Yes, sir, I know the lands of John A. Williams. I have hunted and fished all up and down the river there ever since. Mr. Williams' land along the river there is what he calls pasture land. You take it back a ways from the river and there is some salt grass and blue grass, but it is grazed down so that you couldn't hardly tell what would grow if it had a chance. Along close to the river it is grown up with underbrush and cottonwoods and willows most of the way. It is low land. It is just low enough so that the river breaks out all over when it gets on a rise. I can't say how far up and down the river Mr. Williams' land extends. You take it from the Mount Hope bridge this side and he starts in there and owns pretty nearly to the bridge there south of Bentley. I expect he owns probably ten miles of river front. No, sir, the river
8135 does not back up over the most of his land. (Objection.) It backs up in sloughs and covers his pasture over pretty well back half a mile or such a matter from the river—from that to

three-quarters of a mile. A good share of his land lengthwise with the river, not back from the river, overflows from the river.

As to whether there is made land all along Mr. Williams' land, I will say, not all along, but in most places. There is once in a while a place where the channel has come to the north and there has been made land on the south side of the river, but two-thirds of the way along his land, as near as I can tell, there is made land.

8136 I began hunting and fishing on the river to make my acquaintance with it in 1875. As to the river all along where I have known it from 1875 on for ten or fifteen years (objection), I will say, in 1889 I rented that place and a gen-
8137 eral freshet came. The water came around there, and in low water I think one of the channels didn't run at all; the other two ran all the time, and I filled them in. There is a man by the name of Blobeau who owns the farm at the present time, and I think there is about forty or eighty acres taken in. The three islands are all in the pasture now. From 1875 I had a skiff on the river, and we never could cross it without a skiff, hardly. We never tried it. If we wanted to cross the river the people would go to Hutchinson or come to Wichita to the Douglas Avenue bridge. That was before the Mount Hope bridge was built. Once in a while a fellow would venture in on horseback and cross that way, but I was too timid to do that.

8138 As to the flow of the river from 1875 on for ten years, I would say there was always a good flow of water. I was about thirteen years old in 1875. As to the width of the river from 1875 down to 1889, I will say, from 1875 until the present day I believe it is about a third narrower, but up until that time I couldn't tell you just how much change there was. It was taken in some. There was a gradual change in it. As to other changes besides the narrowing of the river, I will say I have noticed nothing only where they have moved out their fences and taken in this land that has grown up to cottonwoods and willows and such as that, and whenever we do get our freshet—we used to count on a June rise when the snow melted in the mountains. When I was a boy the river hardly ever got out of its banks to amount to anything; when we have a little freshet now it backs out all the way from a quarter to half a mile. I have caught fish half a mile from the river with a pitchfork in these pastures on Mr. Williams' land.

8139 As to the width of the river now compared with the earlier years, it is a good deal narrower now and lots of times there is not much water there in the summer time. Yes, sir, there are islands along there now, lots of islands and sandbars. As to the carrying capacity of the river now as compared with the first ten years, I don't know as I understand exactly what you mean, but there is not nearly the water there that there used to be. As to the carrying capacity of the river now compared with what it used to be, I don't think as far as the amount of water the river would

carry—it can't carry the amount of water now that it did in its natural state in those days. It was a good river the year round in those days. You put that much water in it now and you would have it back over the pastures a good deal, and it has been back over the pastures this last year. No, sir, the flow of the river in 1904 and thus far in 1905 has not been a tolerably uniform flow. In an
8440 early day there used to be water nearly the year round. (Objection.) I moved there in 1889. No, sir, the flow of the river for the year 1904 has not been uniform. It has been bank full and backed out over the pasture, and then it would fall two
8141 or three feet and go down until you could wade anywhere you wanted to, and a couple of weeks more and it would be bank full again. It has been up and down. Yes, sir, I assisted a man to put in some stuff to fill along the banks because I was hired to do it by the man that owned the land. His idea was to put a dike across there and a little brush on top of it, and when the June rises came that would fill in from six to eight inches or whatever it might be with that miry sediment. Before that time there were three islands there. (Objection.) The water always, the year round, ran around all of them. It certainly does on the north bank of the river. It went dry on the north place where it ran around that island. It
8142 ran around in a freshet, and in the other two places it ran continuously. Yes, sir, the river kept on receding. (Objection.) I lived there in 1889 and the people began to think
8143 about taking in that place and went to work at it and it made lots of made land and it took several years to do that. The river has been receding right on from 1889. Before that time I never took much notice of it.

As to the underflow, I have got at my place in Bentley, two and a half miles north of the river, a cyclone cellar or cave, and I know we have about three feet of water in there now. We never have been able to use it, and I think it was yesterday morning or
8144 day before it had raised about four inches. (Objection.) And whenever the river rises or lowers the water in that cave either rises or lowers. Whenever the river rises or lowers, in twenty-four hours you can see it in the cave. It is either higher or lower. I have never used the cave since I built it. That cave is two and a half miles from the river. No, sir, the water that rises in that cave does not run in from the surface. Not this year. It did run in last year during the big flood, but at other times it comes in from the bottom. The rains in the country do not seem to affect it; it just seems to be affected from the river. During the last ten years in the growing season of the year, and especially in the months of August, September and October (objection), the river has
8145 been very low. During the last six or eight or ten years during the month of July (objection) we have generally there at Bentley during July and August figured on the river going down so that we could catch a good many fish. It generally dries up in pools. There is a very little running water. Bentley is about four and a half miles from the Little Arkansas river.

Cross-examination:

By Mr. DAWSON:

Yes, sir, Bentley is on this delta or strip of land that lies between the Big river and the Little river and is about two and a
8146 half to three miles from the Big river and about four and a half miles from the Little river. No, sir, there is no creek or slough or anything of that kind running near Bentley.

Yes, sir, I saw the river along close to the 4th of July, 1874. Yes, sir, that was the time I went down for those sand plums. I drove down on the 5th. As to July 5th being pretty early for plums, I will say there were plenty of them there. No, sir, they were not ripe. No, sir, we did not go to bring them back with us, we just went to see them. We were from Illinois and went to see the river and the sand hill plum bushes.

No, I do not mean to say that the water backed up all over Mr. Williams' land. He owned land three or four miles from the river. I meant along the river, frequently back half to three quarters of a mile. Yes, sir, I have been over that whereever there is low
8147 ground. Yes, he owns a great deal more land that the river does not go over than of land that it does go over, taking it all together. He is one of the large land owners in that section up in our country. No, sir, there is no larger land owner around there than he. Yes, sir, he has a considerable amount of land upon which he raises corn and wheat and plowed crops, but I don't know just how much. Yes, sir, I go fishing once in a while there now. I don't have as much time as I had before, that is the trouble. No, we haven't got the fish there now as we used to. We haven't
8148 for some time. The river has been too high for us this spring so far, but when the river is right I suppose we have the same fishing. Yes, sir, I have caught them within the last two or three years, and they are about the same kind of fish—catfish and carp. As to whether the fish in this river are the kind of fish that like muddy and sluggish water, I would say, China catfish I always supposed were catfish that liked pretty good water. That was my understanding of it.

Yes, sir, I know of other islands than those I helped to attach to the mainland that farmers along the river have attached. There are several of them there but I couldn't tell you exactly whose they are. Yes, sir, that is done pretty generally along the river from the Mount Hope bridge up to Bentley. Of course when you fill
8149 up a channel and attach an island to the mainland that narrows the channel of the river, yes, sir. As to the two of these islands that I attached or helped to attach to the mainland, as to whether the water had quit running in the channel when we commenced to fill it up, I would say they still had a stream running, and he filled the north one up, and it was dry. We would fill them up when the river was low, yes, sir. When I speak about commenc-

ing to fill in, I mean that we commenced when the river was going down, yes, sir, and when it would come up that would deposit the mud and stuff when it went down again in behind our filling, yes, sir.

As to whether the river was practically dry at Bentley in 1879, I don't know. That was before I was down there. I didn't live at Bentley at that time. I am a very poor hand to remember dates. The river has been dry once or twice, I know. Yes, sir, it was dry in 1874, the grasshopper year. As to its being dry for two or
8150 three years after that in the early days, I would say there was a time or two when the river was dry but I couldn't tell you the dates.

I am running a general store and lumber yard for some people at Bentley at the present time. They don't live there, but I am the manager there. It has been about eight or nine years since I sold my farm and came to Bentley. Since that time I have not farmed.

There has been a better stream of water flowing in the river for the last year than there has been in it, at the same time. When the river is up it backs out into the low land like it did, for wherever I saw it it didn't seem to hold the water. Yes, sir, I referred more particularly to the river filling in or growing fuller and the channel growing smaller so that it can't carry as much water. The river has got so small that it can't carry the water that comes down at
8151 times without flowing over.

No, sir, this little cyclone cellar I spoke of is not near any creek or stream. It is on land about as high as there is in Bentley, and my supposition is that the water in that cave is about on a level with the water in the river, but I never ran any levels to determine that, no, sir. Yes, sir, I said the river would make itself apparent there in about twenty-four hours after it rises. As to whether the river when it rises backs up through any sloughs or low depressions near Bentley, nearer than this two and a half miles, it probably backs up about half a mile this side of the bridge there. As to about how high this ground where the cellar is is above the level of the water in the river, I couldn't tell you. It is probably about two feet from the top of the ground to the water level of the cave now, but I don't know whether
8152 that would be on a level with the water in the river or not.

As to whether it is the main trouble on those low flats out there that we have too much water, or not enough, I would say, it used to be up there—you would hear the farmers talk. We would hardly ever know what a failure was in a crop of corn. If we got a southwest hot wind or thought we were going to, there was lots of water in the river, while of late years, when the river is low and there is lots of sandbars there, it seems like the hot winds come more than they used to, whether it is on account of more or less water there certainly I don't know. I am aware of the fact that hot winds are much less frequent in Kansas than they were in the early days before Oklahoma was settled, but nevertheless we have come

pretty near having a failure on account of hot, dry weather in August now for about two years. Yes, we got plenty of rains from the mountains last year, because we drowned out. And the year before we didn't get enough rain at the time we needed it. We needed rain generally aloug in July and August. Yes, sir, if we have a season when we get good and seasonable rains and not too much that makes a good crop. If I can get rain whenever we want it we don't care whether there is much river there or not, we get
8153 good corn. If we do not get good rains and that river is full of water like it is now you can raise a crop every time. It never has failed yet. Two miles from the river we can get a corn crop regularly. Yes, sir, if it is full like it is now. That is my experience. As to whether it is a fact, as generally claimed, that Sedgwick county has raised more corn in the last three years than any other county in the United States, I will say, they used to call our country up there Egypt. All the fellows came down from the high lands down in there to buy corn. But lately we have been falling off some. As to our having farmed that land in corn for many years right along, I would say they change around. Some of them change from corn to wheat and oats, and they commenced to do that changing ever since I first came there. As to its being pretty generally true that corn has been raised year after year, sometimes for fifteen or twenty years, on the same land there, I would say, corn is the principal crop and there have been a few farms that have been pretty nigh corned to death, but they have been changing it for the last few years. As to whether when I likened our
8154 country there to Egypt I meant the older Egypt in which they had seven years of plenty and then seven years of famine, I couldn't tell you that. We always used to call it "coming down to Egypt" to get their corn, but why they named it, I never studied that part of it out. No, I never noticed that we have six or seven good years and then six or seven bad ones. It never has been that way. There have been about three of the worst years now I ever can remember. Yes, sir, that is 1904, 1903 and 1902. And as to its being a matter of fact that in the year 1904 there was a good flow of water in the river in July and August and even up to September and October, I couldn't tell you.

Redirect examination.

By Mr. ASHBAUGH:

As to why parties came down from the uplands to this "Egypt' to get corn, I will say, well, because we raised the corn in there and theirs burned up. They didn't raise good corn. They raised
8155 grain, but hardly raised a corn crop. They always have raised some corn there, but last year it came very nearly drowning out on the low lands. There was quite a little corn in the country then. As to what the conditions are that make a good corn

crop on those bottom lands when they do not have any corn on the uplands, I will say, plenty of water in the Big river.

As to what proportion of Mr. Williams' land overflows, I will say it overflows from one-half to three-quarters of a mile back, because it backs up in places, and then there is a place along next to the river on some of them knolls where it is out of the water. As
8156 to the width of the made land along the river by Mr. Williams' land, I should judge on an average it was ten or fifteen rods wide.

Yes, sir, I know Mr. Oscar Winters' land. There is a part of that that runs up pretty well and the balance of it is low. I don't know whether it is subject to overflow. I think, though, there is a part of it, probably, that is low enough so that it would overflow in such a flood as we had last year. Yes, sir, I think the river was dry twice in the early years, in 1874 and 1879, but I am not positive about that. No, sir, I never saw it dry in those early years excepting those two times.

8157 As to whether the people along the river filled in because the waters in the river had receded prior to that time or whether the waters receded because they had filled in, I will say they filled in because the water had receded. If it had not receded they never could have filled in. The river is narrower than it used to be, in my opinion, and on account of its being narrower there is not enough water there—it isn't washed out like it used to be and it has filled in, and there is not as much of a flow in the river during the last ten years as there used to be. As a general thing, taking it one year with another during the growing season during
8158 these last years it has been very low. The corner of Sedgwick county I spoke of may be twenty or thirty rods from the river. Sedgwick county corners right north of the river a short distance.

8159 P. V. HEALY, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I have lived in Wichita, Kansas, since the early spring of 1876. I came down here on an excursion in 1872. I saw the Arkansas river between 1871 and 1872 only once. Yes, sir, my experience in this country begins in 1876, and I have lived here ever since. I am in the real estate business and have been in that business all these years, about as extensively as most real estate agents. Yes,
8160 sir, I have been an active real estate agent in Sedgwick county.

During these last twenty-nine years I have been about as familiar with the Arkansas Valley lands as anybody could be. As to the appearance and condition of the river during the first fifteen years I knew it (objection), I will say the Arkansas river was considerably wider for the first ten years I lived here and there was a

great deal more water in the river during a greater portion of the time and the channel was wider and deeper. There were two large islands down south that I was agent for, just at the edge of the city now, and on the west side of those islands there was a channel that during part of the spring and summer you could hardly drive across to the islands. That channel is entirely gone and the islands have become part of the mainland on the other side. You would hardly know that there are islands, only by the map. I couldn't
8161 see that the islands or sandbars had increased very much until the last fifteen years. During the early years I think the channel of the river through Sedgwick county was not impeded by sandbars or islands to any great extent. As to what changes I have noticed since those early days, I will say during a great portion of the summer there wouldn't be so much water coming down now. The cottonwoods would grow along the edge of the river and on the islands, and I remember one place where I sold a farm down here about six miles southeast of town and the deed or patent called for about 140 acres. There was a wide channel between that and the bank, and now there is over 200 acres in the farm, by accretion. As to what caused the channel to fill up, there was not much water to keep it washed out. As to whether it filled
8162 up by natural or artificial means, it filled up naturally. Trees kept growing in on sandbars, and there are trees as large as my body there now. They are cottonwoods mostly. There is another place down here where the city put in a sewer along in 1887 and they put the mouth of the sewer right in the channel of the river and now the channel of the river is pretty nearly 200 feet south of the mouth of the sewer and the bank is about four feet higher now. I have sold land and have been acquainted with the river about forty miles up and down. I am not acquainted very much above Mount Hope nor south farther than Derby. I am acquainted with the river that far up and down.

As to how the carrying capacity of the river compares now with what it was in the early days, the water being at the same height as judged from the banks (objection), well, we had a high
8163 water here in 1877 and the main channel of the river was about ten feet deep and it was 800 feet wide and on the west side abutment of the bridge there was a low place there that was 800 feet wide and about three feet deep. That was during the flood of 1877. I have never seen as much water since. They talk about the flood last season, but in the Big river there was not much more than half the water. As to the water last year coming up on the Douglas avenue bridge about as high as in 1877, I will say, well, that bridge—the floor line of that bridge is not over 475 feet long now.

As to the carrying capacity of the river now as compared with the earlier years (objection), I think it is but very little over
8164 one-half. If the same amount of water should come down now that did come down in 1877 it would overflow the

greater portion of the Arkansas valley and go all over this town, in fact last year this piece of land I speak of—in 1877 none of that country had overflowed, and when the river narrowed up, there is a high bluff on the east of that farm that I referred to a while ago, a nice bottom land but not low bottom land, on the west side. Well, all that bottom land last year for about two or three miles we had overflowed and the crop was entirely swept away. Steve Balch and Harner and all the best farmers down there lost all their crops.

Yes, sir, I remember the growing of Ackerman's island. (Objection.) Ackerman's island, or as we used to call it, Mallet's
8165 island, was a small island there of about twenty-six acres, and the south point came down within about 500 feet of the Douglas Avenue bridge—four or five hundred feet—and on the west side of the island the channel was pretty straight until it got right to a point 400 feet south of the Douglas Avenue bridge. Since that time the river—there has been a bend put in the river by being filled in on the west side, and the island has moved on down until the point of it is south from the Douglas Avenue bridge. There is a little of it comes right under the Douglas Avenue bridge; and it has gone north six or eight hundred feet. I should judge there were fifty or sixty acres in Ackerman's island now, and originally about twenty-six acres. As to about how long it has been since Ackerman's island began to perceptibly increase in size, I will say it is from twelve to fifteen years. It has been growing very rapidly.

As to other islands up and down the river that have per-
8166 ceptibly grown in the last fifteen years, there are two or three little islands that started about fifteen years ago, about six miles southeast of here, that have grown until they have already got to be pretty nearly one; and then there was an island that the water works is on, known as Tim Lane's island. It accumulated and went west and growed larger in the west, and both north and south, spread out, and the north side of it became attached, although at one time there was quite a deep, distinct channel between the island and the mainland on the north, and a few years ago it became attached to the mainland, so much so that the owner of the land on that side tried to claim it as an accretion to his farm. A law suit grew out of it. That is known as the Lane-Steinbuchel case, yes, sir.

As to how far back from the river the underflow extends (objection), I will say the underflow flows east. It has been always very perceptible as far east as Chisholm creek, which is about a mile and a half, and in some places farther, and flows west
8167 as far as the upland. Yes, sir, that condition extends up the valley on the west side of the Little Arkansas river. As to whether the underflow is perceptible in all the lands between the Arkansas river and the Little Arkansas (objection), I will say it is.

(Motion.)

8169 JAMES BEAL, Wichita, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live at Bentley, Kansas, in Sedgwick county, and have lived there twelve years and have been acquainted with the Arkansas river since 1877. I lived the first year right east of the bridge about three-quarters of a mile, and then I lived a couple of miles northwest, from 1879 to 1893. I was in Ohio from 1878 to 1881. My business since I have been acquainted with the Arkansas river has been farming. I am a carpenter now. I quit farming in
8170 1893. I was farming in the Arkansas valley. Since 1893 I have lived in Bentley, about two and a half miles from the river, and have frequently seen it since that time.

As to the condition of the river when I saw it first, I will answer, the river when I saw it first—there was very little timber along it. What there was was large timber. And the river had a wider channel than it has at the present time. It looks to me as though in places it was filled up half way and timbers grown on these islands or where it has filled in. As to how the flow of the water in the river at the present time would compare with the flow as it
8171 usually ran during the first ten years (objection), the flow of the water is not nearly so great during June and July as it used to be. It has not been. But the last two or three years we have been almost flooded out in our part of the country. This was on account of the floods the last two years. Exclusive of floods, there has not been so much water flowing in the last ten years as there was before that. I couldn't state how much difference there has been, but there has been a material falling off. I couldn't state as to the extent of the decrease (objection), but there has been a
8172 decrease in it, surely. That is noticeable, and I have observed that fact. In the latter years the river has gone dry—I have seen it dry at two or three different times that it didn't run water at all in the last ten years. I couldn't tell you now the dates, but up until 1890 I never did see the river dry. I am satisfied there was more water flowed down the river in the early years than there has been in the last ten or fifteen years. (Objection.)

Yes, sir, I am somewhat acquainted with what is known as the underflow along the river. When I was on the farm I had two open wells. I got it in a very short time after the water be-
3174 gan to rise—in twenty-four hours anyhow. (Objection.) I could tell by the way the water rose in the well. The water would rise in the well after the river would rise, and I could tell it within twenty-four hours, and it would go down the same after the water in the river had fallen. Yes, sir, I noticed that in two different wells. They were both located about a mile and a quarter from the river and were fifty yards apart, on two different hog lots that I had. I dug those wells in 1883.

As to what effect the underflow had upon the growing of corn in our neighborhood (objection), we used to think it did lots of
8175 good. If the river was up we generally counted on a crop of corn—we could count on it. And that was my experience as a farmer. We were never hurt very bad by a rainfall. As to whether we could raise a crop of corn in the early days regardless of rainfall (objection), I will say we have raised crops with very little rainfall. The ground kept moist all the time through the growing season, and it was supposed that this moisture came from the river. That is what everybody claimed, and that is my idea of it. Of late years I have not been farming, but I have heard a great deal
8176 of kicking. (Objection.) Of my own personal knowledge I know that they have not raised very good crops for a few years, and it is my opinion that that is attributable to the underflow, but of course I haven't been experimenting with it at all. That is based upon my personal observation and experience in the raising of corn in those bottoms. (Objection.) I believe the underflow has gone down in late years. (Objection.) I have no per-
8177 sonal knowledge of that myself.

As to Mr. Williams' land, a part of it is very low and a part of it runs up in what we would call pretty fair land. It would be farming land. Within half a mile of the river his land is all pretty low, but then his land runs back farther than that. As to the effect of high water on Mr. Williams' low land (objection), I will say it has been overflowed pretty badly a time or two, and the water would go over it if the river got high. A part of his land
8178 will overflow without the river getting out of its banks if we get an overly heavy rain and it keeps raining. There will be a little of it overflowed without the river being high. There are sloughs like that will fill up and spread out over a part of it, but not so much when the river is not full, but when the river is full it overflows pretty badly. In 1895 it overflowed out as much as half a mile or better. I know his land runs four or five miles up and down the river and that it overflows the whole ground. As to Oscar Winters' land, what he got off my brother's farm is low; it would overflow. Eighty acres of his land is bottom land, and I suppose at a right high time the water would cover sixty acres of it any-
8179 how. The river would have to be full before the slough would overflow it. I saw it in 1877 when it was so wet here that about forty acres of it was under water that year. A part of Mr. Winters' land is subject to overflow—I would say forty to sixty acres. (Objection.) As to the narrowing of the stream along by Mr Winters' and Mr. Williams' land (objection), I would say it
8180 has narrowed in places nearly one-half, as near as I can tell by actually looking at it. Of course I have never measured it and don't know what it would measure. As to what has brought about this narrowing of the channel (objection), I think it is the river running dry and the cottonwood and willow seed dropping on the sandbars and growing up and making islands that have grown

up there and filled in. I think that has caused it. There is not enough water to wash it out. As to how far along Mr. Williams' land this extends, I will say it extends up as far as three miles west of Bentley where there are islands filled in. Farther west than that I have not been lately. As to how many acres of made land
8181 there are along by Mr. Williams' land (objection), I will say I couldn't give you how many acres, but I will say there is as much as thirty acres in timber right now west of the bridge at Bentley. The Bentley bridge was rebuilt in 1895, and it is shorter than it used to be. They took off one bent. As to what caused them to take off a bent, it filled in on the south side and filled under the bridge, like, and had grown up in willows, narrowing the stream, and they narrowed the bridge too. I wouldn't say how much they narrowed the bridge, but I was going to say it was forty feet. I wouldn't be positive about that.

Cross-examination.

By Mr. DAWSON:

8182 As to my only having been on the river a few years before 1890 as compared with the number of years I have been there since, I would say we moved there in 1877, and I was in that country two years, but in 1879 and 1880 I was not there. I don't know a thing about the year 1879, whether the river went dry or not. I haven't been farming since 1893, no, sir.

Mr. Williams' land that has been spoken of is what we call bottom land, but some of it is lower bottom than others, yes, sir. Yes, Mr. Williams has a good deal more land that don't overflow than land that does overflow in high water. He has land back from the river, out of reach of the river. Yes, it is on what we might
8183 call the bottom to the Little river. Of course some call it bottom land from one river to the other. Last year he had mighty little land that he raised anything on. The water got away with pretty nearly all he had last year in the way of corn. Yes, sir, he has more land that don't overflow from the river than he has that does. It was not overflowed in 1877 by the river. Yes, sir, the flood of 1904 did overflow lots of the land that hadn't been overflowed from the river since 1877.

8184 Yes, sir, they have narrowed up the river considerably here at the Douglas avenue bridge. I don't think they have done that up our way.

(Defendant Colorado's Exhibit 32 offered in evidence.)

OXFORD, KANSAS, June 14, 1905.

W. H. POOVEY, Oxford, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live five miles northwest of Oxford, in the Ninnescah bottom, and I have lived there twelve years. Prior to that time I lived between the Ninnescah and the Arkansas river-, about a mile and a half from the Arkansas river. I lived there about six years.
8186 I came to this country first in 1880 and have lived in Sumner county continuously ever since. During the twenty-five years that I have lived here I can't say that I have been real familiar with the Arkansas river. I have been to it very often and have crossed it a great many times, and I lived for a number of years within a mile and a half of it, and the last year I have lived within two and a half miles of it.

During the early years, from 1880 to 1890, there was very little timber on the Arkansas river when I came here and along about that time. As to its width (objection), there is considerable
8187 timber on it now where the bed was when I came here, and in those early years the river was wider than it is now, and there is made land along the banks of the river. That extends as far up the river as I have been above Oxford, five miles at least. Yes, sir, the river is narrower from Oxford up five miles than it used to be, and I expect it would average 100 feet narrower on both sides. As to the bed or channel of the river, I can't see any change. There hasn't been any change. I can't say whether it is deeper or not; that is, the banks are not any higher, I don't think, than they were then. As to whether the banks on an average are as high
8188 above the average channel as they were twenty-five years ago, I will say, no, I don't — they are, quite. As to islands (objection), I will say there are more islands than when I came here, and they are considerably larger than they were. I don't know of any increase in number. The changes I have noticed have taken place since about twelve years ago.

As to the carrying capacity of the river now as compared
8189 with what it was the first years I knew it (objection), I think there is considerable difference in the flow of the water—in the width—and I think there is considerable difference in the carrying capacity; it is not nearly as great. (Objection.) It is less, of course. As to the flow of the river, excluding floods, for the last ten years in comparison with the first ten years I knew it (objection), well, it has been considerably lower.

Cross-examination.

By Mr. HAYT:

I came to this country in 1880, yes, sir, from Indiana, and my business prior to coming to Kansas was farming. I farmed in the central part of the State of Indiana. I was not near any large stream up there. I was close to some small streams. I lived
8190 in Boone county, and lived there for thirteen years. No, sir, I haven't been back there and visited that place. As to how the streams there now compare with the streams as they were when I was a boy, I will say I was not a boy there. I am formerly from North Carolina. That is where I was born and raised. No, I didn't notice any difference in the streams in Indiana when I lived there. Yes, sir, I have been back to North Carolina. I was back there this winter. As to the streams there, I would say the river is wider than it was when I left that country. I was raised right close to a pretty good stream. It is wider today than when I was a boy. As to the depth of it, it was in the winter and I couldn't tell you that.
8191 No, I don't believe there is as much water there now as when I was a boy, of course. (Objection.) As to whether it is true that as a country settles up and time goes by the streams lessen in the amount of water and that that has been my experience, I don't know as I have paid particular attention to that. I suppose that would be the case, but wouldn't undertake to say it would be. As to paying much attention to the Arkansas river, I would say I have crossed it very often. As to whether in those early days when I first settled there I paid very close attention to the flow of the water in the river, I would say a good many times I did when I wanted to cross it. I don't know as I did particularly charge my mind with remembering when the river was high or how much of the time it was low during those years. I didn't pay very much attention to it. As to when I first began to notice that there was less water in the river, I will say it has been about twelve years ago, or ten or eleven or twelve, along there, there seemed to be less water in it than there had been formerly. There has been right
8192 smart of water in the river this year and last year. Yes, there has been as much water in the river as at any previous time. We have had floods, of course. As to whether there is rather more water in the river than during the earlier years, from 1880 to 1883, inclusive, I would say I don't know as there was. There was a part of that time the river had as much water in it as now, part of them years in between there. Yes, I think we have had as large an average flow as we have had during the last two years. I think we have had as much water, that is, inside of that time. Yes, sir, more than at the present time. No, I don't just remember particularly the river in 1880 and 1881. I don't know as I paid any particular attention to just that year. No, I didn't see the river in 1879. I never saw it until 1880. Yes, sir, I remember the
8193 first time I saw it in 1880. That was the 1st of September,

and there was not so much water in it then but what a man could cross it by fording it. I was not rather surprised to find the Arkansas river with so little water in it the first time I saw it. (Objection.) I had heard of it a little but not very much. (Objection.)

8194 I don't think there are any more islands in the river now than during the earlier years. Not that I remember of. But they are larger, yes, sir. They extend farther. I couldn't tell you just how many of them have been so enlarged. There are several in this number of islands that were in the river when I came here that are on the side now. Yes, sir, I know of two instances where the river ran around them, that is, on the side of the river, and now it very seldom runs around them any more. As to whether this is a river that changes its channels frequently, I would say not much. That is, as far as I have been along it. There are some few places where it has changed a little, but very little. There was not a great deal of timber when I first located here, no, sir. Yes, sir, there is a great deal now, considerable more than there was along the river then. I don't think that is any detriment to the country. I think it is of great advantage to have the amount of timber increase.

8195 I raise corn and wheat and oats, and I depend upon the rainfall, yes, sir, for the growth of those crops. If we have a good rainfall we have a good crop, ordinarily, yes, sir, and if we have a poor rainfall the crop is poor.

As to the value of lands now as compared with the value of lands when I first came here, I would say they have advanced since I located where I am, considerably. Yes, farming land has all advanced in this country in the last three or four years. I would consider that it has doubled in the last five years. About one-third.

8196 I can't say as to whether this country never before has been as prosperous. We are prospering pretty well here, that is, most of us. (Objection.) I suppose the people are generally as prosperous now as at any time in the history of the county. (Objection.) Yes, sir, I believe that the future of this country is bright for the farmers. No, sir, I would not have any hesitation in recommending a friend to locate here and go into the farming business at this time. (Objection.)

8197 No, sir, there are no other obstructions in the river at or near this county that I know of. As to there being a dam close to Oxford here, I would say, not that has been put in since I have been here. There has been a sort of a one here, not much of a dam I wouldn't call it. That was put in before I got here—before 1880. It is located about a mile west of this place, I think. I don't know whether it was in better condition when I came here than now. I didn't see it when I first came. I never saw that dam until about seven or eight years ago. I don't know as I can tell you what material it is composed of. The water ran over it mostly when I saw it. There is some rock in it, but they are not laid up to any systematic point at all; they are just thrown in, it looks like, into

the river. No earth back of the rock that I could see. Nothing back of it, no, sir. I don't know as it is filled on the upper
8198 side close to this rock with sediment and deposit. I never examined that part of it. It don't look to me that it is over three feet high. It wouldn't raise the water all the way across over three feet, I don't think, and I don't think it affects the flow of the water back very far. I don't believe it would raise it for half a mile. About a quarter of a mile, I think. About that. It runs it back about that. The purpose of that dam is for milling
8199 purposes. Yes, sir, it is a mill race and the water is used for running a grist mill—a flouring mill. No, not of large capacity. They use a turbine wheel. (Objection.)

I should say the carrying capacity of the river has decreased somewhat of late years. If it is so much narrower than what it was it would have considerably less capacity to carry the water. As to whether if it has narrowed up it has served to scour out and make the channel deeper, I would say, I don't think the channel is any deeper. As to that being the rule, that where you confine running water in a narrow stream it washes out the sand and makes the stream deeper (objection), I would say that would be owing to the fall it had in any stream. If there was fall enough it would wash it out, and if there wasn't it wouldn't. That is my experience
8200 in that kind of work. For instance, I can tell you a circumstance. I have it right on my own farm. I have a slough that comes down to it, and I have ditched it, and it had not fall enough to carry that water off, and I have it confined in a channel now. As to whether the fall to that slough is as great as the fall to the river at this point, I will say, I don't know just what the fall is to the river, nor to that either. I haven't had it surveyed to know that. Yes, the velocity in this river is pretty fair; still it don't run so very swift. It seems to boil up considerably and don't seem to go off fast like a great many streams. As to whether
8201 I would want to be understood as saying that if the channel of this river is narrowed up and the river is confined to two-thirds of the breadth that it was in the previous years the tendency would not be to scour out the river and make the channel deeper, I would say if it had fall enough it would and if it hadn't it wouldn't. With the fall that this river has I don't think it would scour out very much. As to whether I know of any places here where the river has been cut across bends and where it has scoured out a channel, well, in high water, yes, sir. It has scoured out such channels. No, sir, I don't know of any place where that has been as-
8202 sisted artificially by plowing a ditch or anything of that kind.

No, sir, I don't remember that 1892 was a dry year. It was not, I guess. Our corn crop was not so good that year. I remember it was not so good a crop that we have had. No, I don't remember 1893. (Objection.) I don't remember whether it was an unusually dry year. No, I don't remember that my corn crop was short in 1893. It seems

to me it was in 1891, but I don't remember the year now. Yes, sir, we had a short corn crop along about 1891 or 1892, somewhere along there. As to whether we had more than one short corn
8203 crop along in the early '90's previous to 1896 (objection), I would say I think we had a couple of years; and that shows me that the rainfall during those years was light, yes, sir, of course. (Objection.)

8204 W. L. SHORE, Oxford, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live four miles north of Oxford, on the Arkansas river. My house is a couple of hundred yards from the river, and I can see the river from the house. I have lived there seventeen years, and have lived in Sumner county since 1870. Prior to the seventeen years I lived two and a half miles northwest, a mile from the river. I have been acquainted with the Arkansas river in Sumner county since September, 1870, and have lived in the county for thirty-five years, not over a mile from the Arkansas river, with the exception of about two or three years when I lived in the west part of the county. Still I owned land right here on the river.
8205 As to what changes I have noticed in the appearance of the Arkansas river since I have lived here (objection), I will say there have been a great many changes. There are several more islands, and more water used to run, when there is none only in high water now. The river gets so it has a good deal less water in it during the dry season now than it used to. As to changes about the banks or the bed of the stream, why, the bed of the stream, as far as that is concerned, it seems to be a great deal shallower than it used to be, and it would naturally make the banks lower. It don't take nearly so much water to run out over the land as it used to, that is, up here where it spreads out. The river is not as wide as it used to
8206 be between the banks. I should judge it has narrowed three or four hundred feet anyhow at the least calculation. This 300 feet along the banks is now occupied with young timber. As to made land, yes, sir, on the other side from me there is considerable made land. There is none on my side of the river. Well, yes, there is some, too, at the mouth of the Ninnescah river, there is some made land there that used to be a sandbar since I have been here, but only an acre and a half or two acres. Yes, sir, I live right near where the Ninnescah flows into the Arkansas river. Yes, sir, there are more islands in number, and those that were there when I came here have grown higher and the timber on them is larger. There is considerable land that used to be a bare bar that
8207 has timber on it now to my knowledge. (Objection.) I know of considerable of it, and I can see it from my house. As to the amount of water now flowing in the river, exclusive of

floods, in comparison with the amount that flowed in the earlier years, I will say, why, not half as much, I am satisfied. Seventeen years ago I moved to where I am now (objection), and the river then was always deep fording and very few bars could be seen along it; now there are times of the year when a man can wade it with a pair of common rubber boots. As to how many years it has been diminishing, I will say, seventeen years ago when I moved there there was lots of water, and since then—the diminishing part has been since then. In a number of years—it apparently gets worse all the time. I began to notice the diminution about ten or twelve years ago. I have a brother who lives right north of
8208 Wheatland. He owns land on the east side of the river. His land is river bottom. It has never been overflowed until last year that I know of, and it was overflowed last year. As to the flow of the river last year, as to evenness, with us it seemed to be about the same all the way. It spread out and got over lots of territory up in our part of the country. Yes, sir, that was along about the first of July, and that flood was quite extensive indeed. The river didn't get as low last year as commonly. As to the carrying capacity of the river for the last few years as compared with the carrying capacity twenty-five years ago, the water being judged the same height from the banks (objection), well, it seems it goes
8209 over lots more now than it used to. The supposition is it is the islands and the filling up of the river. That would be my supposition about it, that that is what does it. I has undoubtedly filled up, and it hasn't the room to carry it off that it had formerly. No, sir, the carrying capacity of the river to carry off floods is not as great now as it used to be. (Objection.) Yes, sir, I know of other lands along the river that are subjeet to floods now more than in the early days. All the lands along on the river there as far as I know are more subject to floods than they were, and that is because we haven't the carrying capacity to carry the water off. That is my idea about it. With a less amount of water we are more subject to floods. That is the way I look at it.

Cross-examination.

By Mr. HAYT:

8210 I think there is not as much water in the river during the dry season now as in former years. That is the way I look at it. In the last year and this year we had plenty of water—last year more than we wanted.

I call the dry season of the year from July on up to August and September. As to whether we have had more water than we wanted from last July up to the present time, I will say we have had considerably more than we wanted. But later on the water didn't bother us at all, as far as the bother was concerned, but it was just our one big rise that had the big effect on us. Yes, sir, there is considerably more made land opposite my place, and I

suppose the man owning on this side of the river gets the benefit of it. No, sir, I didn't lose any land by reason of the accretions on the opposite side. I never lost any. Yes, sir, my land runs down
8211 to the river and the river has washed out but very little. My land along the river has heavy timber on it and very few trees went into the river, in fact there are lots of places there is none and there may be places it cut off three or four feet. Yes, that heavy timber I spoke of protects me to some extent. No, sir, I do not regard the growth of that timber as beneficial to the country. I don't know that it is a detriment, but I don't say that it is any benefit. As to how the timber now compares in amount with the timber in this country when I first located here in 1870, there has been considerably more timber set out. There isn't any more timber, only young timber on the river. There isn't as much timber there, in fact, as there used to be, but there is much more young
8212 timber set out. Yes, sir, generally through the country the heavy timber has been extended very much. There has been considerable extension in that way around farm houses and such as that. There is nearly always a grove around a house as a general thing. No, sir, I don't know that the planting of forests and the growing of timber is a benefit to the climate. (Objection.) In one way it has an effect in breaking the wind, but otherwise I don't see that it has any effect. Yes, sir, it has a beneficial effect so far as breaking the wind is concerned. I know there are lots of people cutting their groves that they planted and they are cleaning them off. Yes, they did that because they wanted the timber for fire wood or other purposes and because they didn't want the timber on their land. They got more of it than they wanted. No, sir,
8213 I don't believe that the land generally in this county has been improved and increased in value by reason of the extended growth of timber. No, sir, I don't think it has had any effect. It has not in my estimation, no how. It may be in others'.

As to the value of lands here along the river compared with the value during earlier years (objection), I will say they have improved some, that is, they are higher, but they are all over the country, the uplands as well as the bottoms. It has all improved in value to some extent during the last five years (objection), but I wouldn't estimate it. But very little. I did not say that in my judgment this country is standing still and not improving. (Objec-
8214 tion.) I said the improvement was very little. I don't think it was very much. No, sir, it is not very marked. When the last witness stated that it had increased about one-third in price, as to whether I think he overestimated it (objection), I would say his opinion and mine would differ a little there, yes, sir. I think one-third is about right. (Objection.) Yes, sir, I think well of
8215 this country. (Objection.) I think it a good country to locate in. Yes, it is a good country. I don't know whether I would advise my friends to locate here. I think men can do just as well in other places at the prices land is selling at here. The

price of land will average from about $40 to $60 an acre. As to what those lands were worth in 1903 and 1904, if there was any difference, I don't know what it was, I think they were just as high then. As to lands being too high in value here now (objection), I would say I don't think they will improve in value very much in the future. Lands must be pretty high here. There is not much of it changing hands. I suppose the people are con-
8216 tented enough here. (Objection.) They ask you a price and don't have to take any less, I suppose. They seem to have their prices and hold them—and they hold the lands too. (Objection.) Our crops in the last ten or twelve years are not as good as they were in the previous ten or twelve years.

In 1874 we had a dry year. It was what I call a dry year. Wheat was good but the corn was cut short. There was very little corn planted that year and it didn't grow to make a good
8217 crop. Some said it was grasshoppers took it, but I claim it was drouth took it. Yes, we depend to some extent for the growing of crops here upon the rainfall. If we have plenty of rain we get good crops. We used to think we could raise crops on the bottom land without very much rain, and did do it. Yes, sir, 1874 was a dry year. The river had plenty of water in it, that is, reasonably plenty. It was just like the year—it was less water than usual. I don't recall when we had our next dry year. I don't recollect anything but 1874 that I could date. We have had different years that some crops were better than others. That is, some years we had good crops and other years we didn't have them so good. I don't know whether we had another dry year between 1874 and 1880, that is, to date it. I don't recall. I don't much think we did. If we did it didn't affect me so that I noticed it. I couldn't tell you when we had another failure or partial failure of crops after 1874, but we had failures, yes, sir.
8218 We had partial failures. Yes, sir, we have had several years when the river was low during those early years, but it didn't get as low then as it does now. No, sir, I don't remember particularly about 1879. I was here but was not farming very extensively then, not nearly so much as I have been since. No, I didn't say in answer to a question propounded by counsel that at this time of the year a man could wade the river with boots. From July to the first of September I said that there were times a man could wade it with rubber boots on. Yes, I guess he could wade it to-day with rubber boots, but he would — apt to get in over the tops of them. No, I don't think he would drown. It wouldn't be hard to wade now. Yes, sir, I think it would go over the top of a high pair of rubber boots. No, sir, I don't think it would go over his head in some places. No, sir, not at my place. I can wade it for miles up and miles down right now and it will not do it. I don't think there is enough water to go over my head, unless I lay down there.
8219 Yes, sir, they call it a dam in the river up above here, but I call it most anything else. I would call it a thing. There are a few

rocks thrown in up there. I have no idea when it was built. It was away back. I saw it directly after it was built. I don't think it was any better then than now. You can go over it with a boat most any time. It is merely put in there to throw a little water in the mill race. As to whether there is usually enough water so you can go over the dam with a boat, I would say at this time of the year there usually is, not during the dry part of the year. Yes, sir, it was put in there as an obstruction to throw the water into the mill race. I suppose that is what it is for. No, sir, I have never heard any complaint of that dam.

Redirect examination.

By Mr. ASHBAUGH:

8220 I think that dam extends clear across the river. It is just about alike all the way across. I wouldn't have any idea as to how high it was—two or three feet. I suppose the water makes a fall of that. As to it being so that it would obstruct fish going up and down the river, I would say not much of the year it don't.

Yes, we used to raise better crops on the bottom lands than we do now. As to why that was, I will answer, I put it to the sub-irrigation from below. No, sir, that sub-irrigation is not as near the surface during the last ten or twelve years as it was during the earlier years, during the dry season. (Objection.) As to what I attribute the lowering of the underflow or the sub-irrigation to (objection), why, the taking of the water, I suppose. As to the flow of

8221 the river last year, as to whether it was even or uniform (objection), I will say in where I was you couldn't tell much about the river. They were both up, you know, and of course it backed the water where I lived. The water below my house was still where the two rivers came together, and of course it throwed it. The dam doesn't back the water up the river any distance to amount to anything. Probably two or three hundred feet. I don't think it does though. I don't think it affects it at all as far as that.

8222 J. S. OVERLEY, Oxford, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live four miles north and half a mile west of Oxford, and a little over a mile from the Arkansas river. I have lived there about twenty-eight years. My land adjoins Mr. Shore's, the last witness, on the west. I have 120 acres. I farm this land myself. I see the river pretty often. I have lived right here for twenty-eight years. I rented the last two years before I bought it. As to what changes I have noticed in the appearance of the river during the time I have

lived here, I will answer, I have noticed considerable changes.
8223 As to these changes (objection), I notice the river has filled up a good deal to what it used to be. The bottom has filled up and the timber has grown up in the river and the banks are not as high. It has filled up in the bottom and it hasn't got any channel there like it used to have. There are a great many islands there now to what there used to be. I own about thirty acres there in one island. The river was swift when I came here. Yes, sir, it was a swift river, right where that island is now. Yes, the islands have increased in number a good deal since I have been here, and also in size, and they have grown up with timber. Yes, sir,
8224 there is some made land along here. It keeps filling up, and then timber grows where it fills up. That seems to be mostly on one side of the river, where that thirty acres is, right up the river on the west side.

As to the carrying capacity of the river now compared with what it was twenty-five years ago, the water being at the same height as measured from the banks, it used to run off swiftly and now it is not swift like it used to be, only in times of high water. As to the carrying capacity (objection), I will say no, sir, it don't carry
8225 it off as fast as it used to. It seems to spread out each way and overflows the lands. As to the average flow of the river outside of floods for the last ten or twelve years as compared with the flow during the earlier years, excluding floods (objection), well, there is a whole lot of difference between then and now. There is less water.

8226 Yes, sir, I am pretty well acquainted with the lands across the river. Yes, sir, those lands across the river are more subject to overflow than they were in the early years, and that is because the river is filling up, and it is filling up because it hasn't got the channel it used to have, and it seems like it is filling up on the sides and bottom, and with islands. Yes, sir, that is my observation from living right here. I say if a fellow lives twenty more years he will notice ten times more difference. Yes, sir, from the rapidity with which this has been increasing in the last few years I think it will be all over our land when it comes to high water.

Cross-examination.

8227 By Mr. HAYT:

Yes, sir, high water is a damage to a fellow at any time, I suppose. There has been plenty of water in the river most of the time in the last year, and now there is quite a bit of water in it. Nothing to hurt, though. As to what I mean by the average flow, and as to whether the Arkansas river at this point has no average flow but is up one week and down another and up one month and down another, I would say, well, it is up whenever there is enough water to fetch it, I suppose. In the earlier years it used to have an average flow. As to whether I mean by that that in the earlier years the flow was

about the same from month to month, I will say, along late in the fall it would be down. I know I used to ford it and you would have to swim nearly from bank to bank, and it is here lately up and down. There is a big flood and then it goes down. The flood don't last long. No, sir, that was not true during the earlier years. It was a good channel running all the time. As to whether it maintained an average flow simply from month to month and year to
8228 year, I would say along in the fall it would run down quite a bit. As to whether we had times of flood and violent changes in the water in the river in those years, I will say the river was more even. We had some floods, yes, sir, and some violent changes, but not so many as now. As to whether it is true and well known that the Arkansas river is a river of fluctuating flow (objection), it seems to me here lately that it comes up and goes down and out more than it used to. No, it was not true in those earlier years that we would have times of violent floods and in a few days the water would run out and be much lower. It would be bank full generally
8229 until away up late in the season. I don't know anything about the river up above, but generally here there was more steady water—there used to be—and more channel. Yes, sir, I do remember of the river having suddenly risen and with equal suddenness fallen in those earlier years. We did not have any of those violent fluctuations, though, to bother our farming. Yes, sir, we had them, it did occur, and that has always been true of this river. It rises in the way I guess every other river rises, and goes down. I don't know that it is any different from any other river, no, sir. No, sir, I have never seen it here when the water would rise here two or three feet in a few hours. As to whether I ever saw
8230 it at any point on the Arkansas river when the water would come down in a wall, as it were, three or four feet high, I would say, yes, it comes down sometimes pretty lively. Yes, sir, I think that is true of all rivers. (Objection.) As to excepting the rivers in the East, I will say I have not been in the East for quite a while; and when I say it is true of all rivers (objection), I mean I suppose they all rise and fall. The river I referred to was the
8231 Arkansas river, and the Ninnescah here. That is all I am acquainted with.

8232 As to the flow of the water in the Ninnescah compared now with earlier years (objection), I will say it seems to hold up pretty well. No, there have not been any changes in the banks or bottom of that river. There don't seem to be very much. I don't believe there has been any to speak of. The Ninnescah is a river of pretty high banks in most places. Yes, sir, it is confined within a narrow channel, only in a flood or something of that kind. As to whether there have been islands formed in that river, I will say there are a few little ones. I don't think there is any big timber on them, just sandbars or something like that. Some of these sandbars have formed there in late years, yes, sir. Yes, sir, I think there is just

about as much water in the Ninnescah river now as there was in the earlier years.

I don't remember the first dry year in this county after I located here in 1877. I know we had a dry year, but I don't recollect the date. Yes, sir, we had some drouths in the earlier years
8233 and some dry weather lately—later than the '70's. We had generally good crops every year in the earlier years. I know I raised sixty-five to seventy bushels of corn there and didn't cultivate it hardly any. I don't remember about the year 1881, right to the date. As to whether we had drouths prior to 1882, I would say I think there has been some when we didn't raise as good a crop. In the early days I raised a big crop every year. I think there was one year when we had a drouth between 1882 and 1886—in there some place. It was pretty dry. I know it didn't run, and I had some corn out there, about fifty acres. No, sir, it didn't dry up. It didn't rain. There was a brother-in-law at my house and he says "I wish it wouldn't rain, just to see how much that land would make." And it made about thirty bushels—about half a
8234 crop. Yes, it rained that summer but not when we needed it—not when the corn was shooting. Yes, sir, that is what I would call a tolerably dry year, and the river was pretty low. The driest year in this vicinity prior to 1885 was along some time when we had a dry year I dug down and never got the sub-irrigation like I used to get it. It used to be so that I could just kick it right out, nearly, from the top of the ground, the whole summer there when the river used to be running there. As to what year prior to 1885 was a year of drouth in this vicinity, I said I didn't know the date, whether it was right at 1885 or not. The year when I dug down and couldn't find the sub-irrigation, that has been in late years. I don't remember whether I dug down prior to 1885 or not, but it is since they have been taking this water out of the river. I
8235 couldn't remember whether we had a drouth before the year 1885 in this country or not. There was a drouth, I think, a few years before I came here. That is what they said. Along about grasshopper year. No, I think it was about 1870—along there somewhere. Well, that was a year of drouth. I don't remember any drouth since 1877 and prior to 1885. We had good crops right along in there. There might have been one year that the corn was cut a little short. No, sir, I didn't say thut there was one year when we had no rain at the proper time and only raised half a crop. I said that was here within the last twelve or fifteen years back, a dry year we had that I never raised much corn, but I couldn't tell you what year. I think there was a year prior to 1885 that
8236 we didn't raise a full crop of corn. No, that was not several years; not right along the land where we had. Back farther from the river they didn't have nearly as good a crop as we did right along the river. It hardly ever failed right along the river. As to the value of my land at the present time, I should judge it is worth about $50 an acre, and it was not much different in value

five years ago. (Objection.) Yes, sir, land has improved in
8237 this county during the last five years. It has improved some in value. (Objection.) I expect close to one-fourth. (Objection.) No, sir, there has been no time since I located here when lands were higher than they are now. I don't think they have been any higher. (Objection.) I hope the prospects for the future are good.

8239 As to what interest I have in this suit and as to whether I have any feeling or any desire that this case should be decided either for the complainant, The State of Kansas, or for the defendant, The State of Colorado, well, I think that where a fellow is injured, I think he is against it, of course. As to whether I think I have been injured as a result of something that has been done by the State of Colorado or by the people of the State of Colorado, well, we have been injured every year since they have taken that water away.

Redirect examination.

By Mr. ASHBAUGH:

As to my speaking about the sub-irrigation being lowered by the taking of the water out of the river, and as to how far back from the river that is true (objection), I will say I think it goes back
8240 quite a ways. As far back as where I am living there I could notice the sub-irrigation, and that is a little over a mile, I guess. That is, to where I live, but my place runs half a mile east of there. Yes, sir, I say that the effect of the sub-irrigation is felt back a mile at the place where I live. (Objection.) As to my having stated in answer to a question by counsel that our crops never failed along the river in the early days, I will say I don't think they hardly ever failed. There might have been one year there that I got cut short a little, but not much. As to what I attribute that fact to, that our crops did not fail along the bottom lands in those early years (objection), I will answer, why, it was on account of the sub-irrigation from the river. This sub-irrigation comes up from
8241 the bottom through the sand from beneath, yes, sir. Yes, sir, the level of the underflow rises and falls with the condition of the river, and I have noticed that condition a mile from the river.

Recross-examination.

By Mr. HAYT:

Yes, sir, if the river bed has raised that would have a tendency to raise the water. When I spoke of taking the water from the river I referred to the taking of the water in Colorado for irrigation That is what I suppose they were doing, was taking the water for irrigation. Yes, sir, I think that has lessened the flow of the water. As

to what effect the taking of water for irrigation in western
8242 Kansas has, I suppose it has just as much effect taking it out there. Yes, sir, I am opposed to anyone taking the water from the river above for the purposes of irrigation, and it is immaterial so far as I am concerned whether they take it in Colorado or western Kansas. We don't want it taken out at any other place for that purpose, no, sir.

Redirect examination.

By Mr. ASHBAUGH:

As to whether the sub-irrigation or the underflow rises if the river rises unless the river stays up a reasonable length of time, I would say it would have to stay up so that it would have time to throw the water out underneath. If the flood should come down the river one day and run down to its prior condition by the next day it wouldn't have any perceptible effect back a mile.

8243 JASPER SOMMERVILLE, Oxford, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live three and a quarter miles south of Oxford and just about a a mile from the Arkansas river, and have lived there since the spring of 1874 continuously. I have some bottom land, but not very much as compared with others. I have about 300 acres all together. My house is just about a mile from the river.

As to any changes I have noticed in the appearance of the river in the thirty-one years that I have lived here (objection), I will say, the changes down where I live are not so perceptible as they
8244 are above, I presume from the fact that we have a flow of water from the Ninnescah to help keep up the natural flow of the river down there, but there is some little made land along the river. Not to any great extent, though, but wherever this made land is the young timber is growing upon it now—cottonwoods and the like of that. I have also noticed in the river bed that what I call the sand channel of the river is not apparently as wide as it used to be and doesn't appear to have as much current as it used to have, but outside of that I have not noticed very much change. There is just one or two islands in sight from where I go to my bottom land, up and down the river, that I would have anything to go by in the river, and those in an early day I didn't visit, so I am not able to say whether they have increased or decreased. As to the condition of the river above the mouth of the Ninnescah so far as I am familiar with it (objection), I couldn't say, because I have
8245 never lived up there.

As to the carrying capacity of the river past my place now as compared with the carrying capacity thirty years ago (objection)

the water being at the same height as judged by the banks (objection), so far as bank to bank is concerned it is about the same width, but it looks to me like the sandbars were heavier than they used to be. They used to seemingly be on the move with the current that was there twenty years ago. They would change from place —, but now they seem to be more stationary. They don't seem to change as much as they used to. At my place I would not consider that the carrying capacity was as good as it was thirty years ago
8246 or twenty years ago. As to the channel of the river at my place, it is not as deep as it used to be and it is not as wide, and I suppose it is on account of there not being as much water as there used to be, or else it is narrowing down, and I don't know which it is. If there was as much water in the river now as there used to be, as to whether it would overflow any lands that would not have been covered in the early years, I will say it seems to me that it would. That would be my judgment, and I base that judgment on this idea—that it doesn't remain in the river bed. It flows out quicker than it used to, with the same amount of water, yes, sir. As to the average flow of the river exclusive of floods for the last ten years compared with the flow during an equal number of years twenty or thirty years ago, it doesn't seem to me it is as great.
8247 Yes, sir, I have heard of the underflow in this country. As to how far back that underflow or sub-irrigation extends, well, sir, my experience on that little bottom land I have is that it runs back to the bluff. That is probably fifty or sixty rods from the river at this place. I can't speak of other places like I can of my own. During those rises this irrigation comes up and you can see it in a great many places, but in my judgment it irrigates the whole bottom. That is what I think about it. (Objection.) This bottom varies in width. I wouldn't be able to answer the question as to the exact width. My judgment would be that it would average probably three-quarters of a mile in a great many places. In
8248 some places, like at my place, it cuts off and goes on the opposite side. Right at my place or just a little below my place the bluffs run clear into the river, and then of course the bottom land takes us on the other side and the bluff will run down probably for a mile or half a mile, and of course my idea is of sub-irrigation that it affects the whole of this bottom land. As to how I get that idea, there are some low places in the bottom land that I till and I have noticed frequently that the water would come up and stand there when it wouldn't be on the other part of the land, and there at that same place now it is the last to go down when the river goes down. It goes down less there. That is the only way that I have of telling about those things, and that is about as far as I can explain it. It stands there when the river is up and goes down as the river goes down. As to what effect sub-irriga-
8249 tion has upon the raising of crops (objection), we think it helps us in raising a crop, especially when our rainfall is short, by coming up from underneath. It comes up through the

sand until it gets within a distance that our corn can draw moisture from it, and by so doing it makes a better crop. As to whether we can raise a better crop and have raised a better crop on this bottom land when the rain was not sufficient in itself to mature the crop if the underflow is sufficiently near the surface to furnish moisture for the roots of the grain (objection), I will say, why, yes, it would seem to me it would be natural, and my experience on the land I have there is that with this sub-irrigation a crop is kept growing and kept in better condition than we possibly could keep it without it. That is, right at the time when we need it, along in
8250 July and August. That is the time we consider the most critical for our crops.

Yes, sir, I am acquainted with the lands between Oxford and my property along the river. Mr. Buffington's land is there. Yes, sir, Mr. Buffington's land is so situated with reference to the river that in these later years it is subject to being overflowed, and it was flooded last year pretty badly. I don't think that he raised much of a crop down there last year on account of the floods. That is pretty much the same condition of other lands along there. Mr. Nevitt has a farm that is pretty much in the same condition as Mr. Buffington's—possibly a little higher—and it is so situated that it overflows.

Cross-examination.

By Mr. HAYT:

8251 I have 300 acres in my farm and about thirty acres of that is bottom land and I raise on the bottom land all kinds of crops, that is, a variety of crops—wheat, oats and corn. That is, I mean on the uplands. I have never raised anything but corn on the bottom lands. I have been planting corn on these bottom lands for fifteen years. No, sir, I haven't rotated it with grasses or any other crops. I have been raising it continually. As to whether I think that of itself would have a tendency to decrease the yield (objection), well, it might have a tendency to.

8252 The Ninnescah discharges into the Arkansas river about six miles above here. As to whether during the dry years that have intervened since I have lived down where I now live the drouth has affected the Ninnescah about the same as the Arkansas river, I would answer, I couldn't say as to that. I don't know. To say that I personally know anything in regard to the water in the Ninnescah during those years, I can't say so. No, sir, I can't see the Ninnescah from my house, so far as the flowing water is concerned.

I believe in 1877 was the first time I ever saw the lands between me and town flooded, and the next time was in 1878. We had two years of high water right in succession there. As near as I can recollect, the lands at those times were flooded from two to four

weeks. Now, I couldn't say as to the years 1879 and 1880,
8253 as to how the river was, because I don't recollect that. No, sir, I don't recollect as to 1884 and 1885, as to whether they were wet or dry years. I couldn't say. As to whether my experience has shown me that this is a river that is quite likely to have but very little water in it or a shortage of water for a period of drouthy years and then for a period of three or four years to have a great deal more water in it, I would say I have noticed those conditions, but to take the length of time and the years, I couldn't give it. I have noticed that condition. Yes, sir, I have noticed that we have more water for a period of three or four or five years and then less water for another period of three or four or five years in
8254 succession. When the dry weather strikes us we have less water. I couldn't say for how many years that extends. I don't know. I wouldn't like to state anything that I couldn't recollect. Oh, I would say that those periods of years have been for three or four or five years or something like that. Now, possibly it wouldn't run five years. It might be every two years or the like of that. I couldn't say the number of years. But the general principle the way you state it is something like what my experience or observation has been of the river. Yes, sir, during the last year there has been plenty of water in the river. As to the rainfall, well, I don't know. I couldn't give you an estimate at all because
8255 I don't know. As to what we depend upon for the growing of crops here, whether on rainfall or the river, I would say we depend altogether on rainfall on the upland, and if we have a good rainfall properly distributed we usually expect good crops, yes, sir, pretty generally, and if the rainfall is short it is the natural consequence that we expect a shortage of crops. As to whether that is true of the bottom lands to a greater or less extent, I would say the bottom land is not affected so materially by the dry weather as the uplands. Yes, they are affected by the drouths, more or less.

Including the flood periods, as to whether I think there has been as much water in the river during the last ten years as during the first ten years that I located here, I will say no, sir. Taking the flood periods into consideration, I don't think there has. As to my being able to estimate it, I would say that would be out of
8256 the question. No, sir, I never made any investigations nor any measurements nor particularly charged my mind with reference to the matter. Not so far as any suit nor anything of that kind is concerned. I have never given it a thought. As to whether I paid much attention to it in those earlier years, I will say, during those earlier years we crossed the river a good many times during the dry seasons. We used to ford it in going to Winfield. We used to haul wheat across it. We would have to ford it that way, and of course we were pretty particular not to get into it when it was very deep. As to whether we could ford it pretty generally in those early days, I would say we had to pick our time generally to ford it, but I wouldn't consider that it was safe to ford it for five or six or more months

in the year in those earlier years. My idea and recollection are that we could ford it from about say the middle of July on until the last of September in the years between 1874 and 1879, inclusive.

8257 1874 was a dry year, and it got pretty low opposite my place, but it didn't go dry. I didn't want to convey that idea, that it went entirely dry. Let me just state what we call low for fording now. In the early days when we considered we could get across without the water running into the wagon bed we were getting across in great shape, and in 1874 of course we crossed it when it would be probably not over hub deep, the water in the deepest place, and as I remember now it would probably be seventy-five feet wide and about hub deep, yes, sir. Yes, that would be along about a foot and a half to twenty inches deep, somewhere along there.

8258 As to what would be the average depth of that seventy-five feet across the river at that time, I would say it generally cuts off into the channel pretty tolerably sudden and remains about—one thing, now, you get about across and you often have to jump up onto a sandbar, right out of the channel. I don't believe I could tell when I next saw the river as low as it was in 1874. As to the velocity of the water when the channel was as low as I have described it in 1874, I would say, the current is not so strong when it is low. The current is stronger as the river rises, yes, sir. Yes, sir, I think it is a fact that this river does not have what may be considered an average flow, but is rather a river of sharply defined fluctuations. I think that is a fact.

Redirect examination.

By Mr. ASHBAUGH:

8259 As to how the river has been for the last ten years prior to last year as to fording during the dry season of the year, I would say they have no difficulty in fording it, take it along from August to October. For the last ten years prior to 1904 during those months, as to how deep the river was at the places where I forded it, I wouldn't like to undertake to answer that question now because I don't know.

8260 As to my stating in answer to a question by counsel that we depended on rainfall for the maturing of our crops upon the uplands, and as to whether we depend upon the rain upon the bottom lands, I will answer, well, all conditions the same, we depend on the river and sub-irrigation.

Recross-examination.

By Mr. HAYT:

As to my saying that during the late years we had no difficulty in fording the river during the months I mentioned after the middle of July, and as to whether we had much trouble in fording it during the first five years I was here during those months, I would say, ordinarily in those months the river is down. That is my observation.

8261 SQUIRE STEVENS, Oxford, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live nine and a half miles south of Oxford, in Sumner county, and within 150 yards of the Arkansas river, and have lived on that place about twelve years. I have been acquainted with the Arkansas river twenty-eight years this fall. I have about 130 acres
8262 of land. It is in a strip, part of it right along the Arkansas river and part of it along Slate creek. I live right at the mouth of Slate creek. There is none of my land that is bottom land at all. The bottom land is on the other side of the river. Mine is just bank; it runs right along the river.

As to what changes I have noticed in the Arkansas river since those early days (objection), I will say I have noticed these sandbars, and timbers starting along on these sandbars, and changes like that. As to other changes, there is not as much water, only the high waters when they come, but other times it will get down there at my place, why, I think it was two years ago I could just
8263 jump from one channel to another pretty near across, it got down that low. In the first years I came to Kansas it didn't get down that way at all. The river bed is not as wide along my place as it used to be, and it is not as deep. I mean, taking it on an average. Of course here about a year ago, it was terribly deep then. As to how long I have noticed that there was less water in the river on the average, I would say it was about twelve years ago. When I came back and bought this place, that was about twelve years ago. Then is when I noticed the river had not as much water in it on an average as before. It looks to me as though it had been decreasing during the last twelve years down to last year. I and my wife spoke about it just the other day in my house, and that is my observation of it. If the same amount of water should
8264 now come down the river as in the early days, would fill the channel to the height of the banks, as to what effect it would have upon the bottom land, I would say, why, it would run out over the bottoms. It looks that way to me.

Cross-examination.

By Mr. HAYT:

Yes, sir, I located here somewhere about 1876 or 1877. It was two or three years ago, something like that, when I said I could jump across the different channels. It got down very low. You could just jump from one channel to another on the sandbars without getting wet. That was just above my house. No, in those early years when I located here the river was in good shape all the time

then. No, I don't know how it was in 1874. When I first
8265 located here there was right smart of cottonwoods scattered along here. There are more young cottonwoods now than then. The timber has increased a good deal since I located here—the cottonwoods along the river where I live. That is all I know about it. There wasn't so great deal of timber when I came. I don't think there is a great deal of timber yet, only the young cottonwoods coming. As to whether there are two or three times as much timber now as there was in the early days, I will say I don't know as there is. I came back here about twelve years ago, I think, yes, sir, but wouldn't be positive. I couldn't say exactly how the river was in 1884 and 1885. As far as the year is concerned I couldn't say. The first four years I was in Kansas I lived within a few miles of the river, and of course I have been down to the river a good deal of the time, and when I moved off yonder I just came back to see my wife's people. That would be only once or twice a year. I had enough to live on over there and lived over there the biggest part of the time. Of course I didn't notice the river then for a few years, but as soon as I got back where I live now, I
8266 can look right down the river for two miles or up the river for about a mile and see the river, right where I live. I can lay on my bed and a fellow can play lazy and see it. Yes, sir, I have fished up and down the river a little during the earlier years. We had catfish, and I found some carp and some buffalo and shad and quill-backs. Well, most all kinds of fish. We would catch a few bass out of the river.

As to the crops I raise on my bottom land, when I raise any at all it is mostly wheat. I have been trying to raise wheat. As to whether I have had failures, I will tell you, I had one I know of that was a complete failure. I couldn't say what year that was in, but it was the second year after I came on the place, after I bought
8267 it. I think that was in 1879, yes, sir. We had a complete failure in that one year. I have had bad crops, as far as that goes, very frequently. Yes, sir, we depend on the rainfall for raising crops. If we have rainfall properly distributed I expect to have good crops, yes, sir. That is exactly what I do. I don't know whether the people generally in this county depend upon the rainfall, but I do. I can't say what other people depend on. As to when I first heard that anybody relied upon the underflow here for the growing of crops, I have heard them speak of that frequently when I came back over there, more than I did the first four years in Kansas. Yes, sir, during the last twelve years I have heard them talk about it more than I ever did before. There was
8268 a right smart amount of water in the river last year. Sometimes it has been up big—a heap big. As to whether there was as much in the river during the last year as any other year during the time I have lived there, I will say there might have been. I tell you there has been some big floods come down. Yes, sir, I can say there has been particular damage done by the high water.

Right across the river I could stand on my little porch at the house and see it washing right down through a man's place, and I know it did him damage. It was a channel of the river for a while there while it was up high, until it went down, and they went to work and plowed it up again. There is no channel over there now. As to when I first knew of this river overflowing its banks, I will say, not when I was here before. I heard it did the year before I came to Kansas. I heard that. But in my time it didn't overflow like it has in the last year. No, I don't expect I was on the river
8269 during the wet years of 1884, 1885 and 1886. Yes, sir, I heard that it overflowed its banks the year before I came to Kansas. Yes, I could see the marks of the big flood from the previous year through the timber when I first came here, and that indicated that the river had been pretty high before that. It showed it was. As to whether it was higher that year than it has ever been since, I will say I don't know. And even from that driftwood, I will say, I don't hardly know about that. The first four years I came to Kansas I don't know whether it got up as high as before or not. As to my best judgment, taking these things into consideration, I would say there is not much difference between that flood and the floods I have seen in the river since, from what I could see. I don't recollect going along and looking at the driftwood this last flood. You see I live up on the hill and don't come over on
8270 the bottom at all. Yes, sir, I do recall seeing the driftwood when I first located there. I lived on that side of the river where the bottom was. I live on the same side of the river now but across the creek in the bottom. It was about ten years ago that my crop failed. Yes, sir, that was a crop on the upland, and the river that year was lower than it had been when I first came to Kansas. After I came back over yonder the river, only except in extreme floods is the only time it gets up like it was before.

8271 J. R. JOHNSTON, Oxford, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Oxford, Kansas, and have been in the city here about eighteen years, and have lived in Sumner county since 1876. I have been up the river above Oxford as high as Wichita. I never lived along the river.

As to what changes I have noticed in the river during the twenty-nine years I have known it (objection), it looks to me like we didn't have as much water, as a general thing, in the river here as we used to have, I will say eight or twelve years ago. Our stream
8272 here spreads out over more ground—looks wider—and the channel of the river is filling up, and I have noticed in places along just up here a piece, for instance, there are islands forming by the filling of the river, and I suppose that is done by the filling up

of the channel. Yes, sir, there are islands there, and made land. No, sir, the banks of the river are not as wide as they used to be, so far as I have observed. As to the carrying capacity of the river now compared with what it was in the early days, the water being at the same height as judged by the banks, well, now, a short time ago I went fishing up on the Ninnescah and I noticed that the channel of the creek there is filled up. Where there would be deep holes it has filled, and that water is spread out wider. There is no channel. And I think it is the same way with the river here. That is the Ninnescah I am speaking of, and I think the river here is the same. But where we used to have the channel of the river we don't have any now. That is my observation. As to how long
8273 ago it was that I noticed this decrease in the amount of water, I would say it has been eight or twelve years, maybe longer. If the same amount of water should come down the river now that came down the river in the early days so as to fill the banks, I don't think we had the overflows along the river then that we have now, and I think that is because the channel of the river has filled up. Now, they used to talk of putting in these dikes to open the channel to run a little boat up here. We don't hear them talk any more, because there is no channel. If the same amount of water should come down now that in the early days filled the banks, as to its effect, it would overflow it and overflow it as much as it did in the early days anyhow.

Cross-examination.

By Mr. HAYT:

8274 I believe it would overflow more now than in the early days. Just as I said a bit ago, it is because we have no channel in the river any more. And the same is true of the Ninnescah so far as I have been on the Ninnescah, and I suppose that is one or two miles, maybe more. I notice where we went up in the skiff where we used to run in the channel now we have to get up there in several places and push the boats. We couldn't go over, and the stream was wider. Oh, when we used to go up the Ninnescah we found deep holes of water. I have been about thirty years in this country, and I think the conditions in the Arkansas valley are about the same, as to filling, as the Ninnescah. As to what I attribute this filling up of the Ninnescah to, I think that is from the back water—from the Arkansas spreading. It spreads out more. There is no channel. There is not the same channel in the Arkansas river that there used to be, and of course it causes the
8275 back water to go up these little streams farther, and I would think that goes up the Ninnescah a couple of miles anyway. As far as I went up the Ninnescah I found holes of water in places and in some places we would have to push the boat over. I wouldn't say that so positively two miles up there, but from a mile and a half to two miles anyway. Now, I haven't been up the Ninnescah

any higher than that this season, but other seasons I used to go away up. No, I couldn't say I have been up farther within the last three or four years.

I stated that I first heard that the Arkansas river was filling up some eight to twelve years ago, that is, since I have heard the farmers along the river begin to talk about them taking the
8276 water. Yes, it was some time between the years 1893 and 1897. As to when I first noticed it myself, well, when I heard those farmers commence talking about it, about eight or twelve years ago. I didn't notice it until after I heard the farmers commence talking about it. No, sir, I didn't go as soon as I heard this complaint and look at it. I never did go and look at it. I myself have noticed in the last six or eight years that we do not have them channels, you know—or eight or ten years—that we don't have the same channel as we used to have. It might have been several years after I heard the farmers talk about it before I paid any attention to it myself. I wouldn't say positively how long it was.

8277 I am in the restaurant business, and have been in that business about two years. I am proprietor of the restaurant, yes, sir. Yes, sir, I was a farmer myself. I reckon I have been a farmer fifty years or more, that is, a farmer, and I have been in the restaurant business and the furniture and undertaking business and in the dry goods business—kind of shifting around. As to how long it has been since I have done any farming in this county, I will say I have been in town here about eighteen or twenty years, and I have not done any farming within that time. I have been in the furniture and undertaking business here for sixteen or eighteen years, and sold out.

8279 JOHN JACKSON, Oxford, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Wellington, Sumner county, Kansas, and have lived in and about Sumner county since 1880. I have been familiar with the Arkansas river through Sumner and Sedgwick counties and have been along it ever- year, sometimes three or four months in the year, fishing. That period extends from about 1887 up to about 1901, when I quit fishing. Yes, sir, I have been familiar with the Arkansas river for a period of fourteen or fifteen years. We fished all along it wherever there was a deep enough place to get my net in. We lived in Wichita one year and fished from Wichita clear down to the Territory. I have been as far as Muskogee, in the Creek nation. I have been down to the mouth of Walnut river, the south fork, and where the Cimarron goes in.

As to what changes I have noticed along the river in those years (objection), I will say I have noticed that the river has not the chan-

nel it had when I first commenced fishing on it. It hasn't
8280 got the water in it, only in the spring floods or freshets, that it used to carry, and it has filled up and made land and banks and where it used to be good channels there are now islands with good size trees on them. The mouth of the rivers along next to it that go into it are filled up. No, sir, taking the channel as a whole it is not as wide by one-third as it used to be; that is, the main channel where the water went. Yes, sir, the islands have increased in number. What were sandbars at low water in the fall of the year are now islands covered with trees and drift, and where there was sand there now is a kind of black loam
8281 filled with sand. Some of these islands are so high that floods do not go over them even in the highest water. (Objection.) I have been down on the river a few days now, I just came from down there, and they don't go over them at all. On those islands lots of trees have been cut. Fellows on the upland went in there and cut them off because they claimed it was a Government stream. It didn't quite connect with some land at high water mark, and as it filled in the farmers claimed it. Some of these trees are eight or ten inches through. Some of them are now that big. As to the flow of the river outside of floods in the last eight or ten years compared with the flow for the first years that I knew it, I will
8282 say, when I first went fishing there was a good channel and you could hardly wade it. It was swift and deep. And where the channel was there was a solid bottom, except in little holes, and in the last few years I have fished it was filled up. Whenever it would fill up like that it would be a soft, miry place, and the channel was not as wide by—it was hard to find a channel to amount to anything only just when there was a freshet. Yes, sir, I should say that the flow of the river outside of floods was materially less the last few years than the first equal number of years. (Objection.) As to how the carrying capacity of the river now would compare with what it was when I knew it first, the water being at the same height as measured from the banks, I will say it wouldn't carry down here I don't believe—well, it would lack one-fourth anyhow and maybe one-fifth of carrying the water now that it would ten or eleven years ago. The banks are not as high now. They are filled up and they are not as wide. If the same amount of water should come down now that in the early days would have filled the river bank full it would spread out all over the bottom lands. Yes,
sir, as a matter of fact all through here the bottom lands
8283 are now more subject to overflow, the amount of water being equal to what it was in the early days. (Objection and motion.

Cross-examination.

By Mr. HAYT:

I don't know as I ever did hear of a pontoon bridge right here in this neighborhood. I have heard of ferry boats on the river. I was not here at Oxford in 1879 and 1880, and I don't know about the pontoon bridge then. I wouldn't say that, because I wasn't here. If there was a pontoon bridge here in
8284 1879 and the channel of the river was narrowed up and filled in so as to leave the channel only 150 feet wide, as to how that width of channel would compare with the channel at the present time, I would say it wouldn't take 150 feet to go over the channel of the river now. I don't know exactly what is the average width of the river in the vicinity of Oxford at the present time. (Objection.) No, sir, it is not a thousand feet between the banks, and I don't believe it is 500 feet. I don't believe it is over 300 now, if it is that. Yes, sir, I would say just about 300 feet. I
8285 never paid much attention to that part of it. It has narrowed within the last ten years, that is all. In some places the bank probably is as wide as it ever was, but it has filled up. It is not as deep as it was. The bank is not as high. In places through this county there is one-third of it narrowed up. In some places this narrowing up would extend to a quarter and in some places eighteen or twenty acres and in some places five or six acres and three or four acres. As to whether there is a good deal of the river where there is no narrowing of the channel, I would say, well, there are places, take it where a stream comes into it, of course it keeps the sand worked away. The bank is there, but not as high as it was. It has filled from underneath. As to where those places are, I would say, where the Ninnescah right up here comes into the Arkansas river it is not as wide as it was, and it is not as wide
8286 where Salt fork comes into it as it was. That is about all the streams that come into it of any size. As to whether there are any other places where the river has narrowed up that I can speak of, there are places all up the river. I have been on the river clear up it. One place about a mile and a half, about the mouth of the Ninnescah, there is a place there nearly half a mile that has filled in, and it has filled all the way from 50 yards to 150 yards. That is on the west bank of the river, and it has grown up with trees, yes, sir. Yes, sir, the farmers come in and cut these trees out, claiming they had a right to do that because it was a Government stream. They cut the trees for firewood and poles and anything they want them for. No, I don't think they considered it an advantage to get this timber. They have no right to cut it, as far as that is concerned, they slip in there and cut it. No, they
8287 wouldn't slip in there and cut the timber unless they gained some advantage. They wanted the poles for some use. I don't suppose they would cut the timber just to waste it.

As to how deep the river is along where the banks are narrowed up, I would say I never measured it and I couldn't give an estimate of the depth through the county when it is full of water. In places it is deeper than it is in other places. As to the average depth of the water when the river bank was full at those places where it has narrowed up, it couldn't be over—you couldn't make an estimate. It would be clear across that river anyhow. Yes, you can make an average, and on an average I don't believe it would be over four to five feet deep.

8288 Yes, sir, I was fishing along the river every year from 1887 to 1901, and I fished both by going along the river banks, and wading, and in boats. I put in May, June and July in the spring fishing, and September, October and sometimes November in the fall. As to whether we fished with hook and lines or nets, I will say, you have to fish in Kansas with a hook and line. I caught these fish for the market.

My present occupation is a railroad brakeman. No, sir, I am running out of Wellington, and we run to every place from there where the Santa Fe goes, for five divisions. Woodward is our main division yard, and Hutchinson, and Emporia. Yes, sir, I run as far north as Hutchinson, and have been braking on the Santa Fe for nearly three years.

8289 J. M. STEELE, Oxford, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live right here in Oxford and have lived on the Arkansas river and have known the Arkansas river ever since about 1884. I have lived in Sumner county ever since 1884, with the exception of last year, when I spent five months in Illinois. I am acquainted with the Arkansas river around Oxford but don't know anything about it around Wichita. My acquaintance extends up three miles. I have been up as far to the dam above the mill. That dam is made of rock. I don't know how high it is. I have walked over
8290 it but never measured it. I would suppose now that seven feet would be about the height from bottom to top. It doesn't extend quite across the river.

As to what changes I have noticed in the Arkansas river along these three miles in the last twenty-one years (objection), I think the river has less water in it, on general principles. In width there are some places it has cut and some places it has filled in. I don't believe it is as wide as a whole as it used to be, and I don't think it is as deep. As to the carrying capacity of the river the water being at the same height as judged from the banks, I think there is a difference. I think
8291 it runs a little bit slower than it used to. I don't believe it will carry water as fast, nor as much of it, if it runs slower.

If the water should come down the river now as it did in the early days when it would just fill the banks, it would run over the bottom lands. With the same volume of water it looks to me as though the overflow of the land would be worse than in the earlier years. (Objection.) The reason I say this is that I don't think the channel is as deep as it was, and I don't believe it can carry the amount of water it used to carry.

8292 I used to get sand out of the river and know about in May and June we used to have what we call the June rise. They claimed that was snow melted from the mountains that made that. Well, I know it would rise and fall every twenty-four hours. I know that from working there in the water every day that it would do that.

As to how the average flow for the last ten years, outside of floods, would compare with the average flow during the first years, outside of floods, I think there used to be more water than there is now. I believe it carried a larger volume of water than there is now, and it seems to me it would make a difference of pretty nearly one-third of the water. If anyone should look at the water now when there was a good flow of water so that it would look to be quite a large river, I think they might be deceived about

8293 the depth of it. (Objection.) No, there is not so much water as there used to be, and at the same width there is not so much water. Yes, sir, I have had occasion to be on the river a great deal in the last twenty years. I worked right in the river for eight or nine years, getting sand out of the river. It was right in the town site of Oxford where I got the sand.

Cross-examination.

By Mr. HAYT:

My occupation is most anything I can get to do. I have no particular occupation at the present time. For the last year or two I have been getting out sand, helping to thresh, butchering and such as that, and hauling sand. This sand is used for shipping,

8294 commerce and building. We ship it to different points up and down for building purposes, yes, sir. I think this dam is about seven feet high. I couldn't say how broad it is at the base, and it doesn't extend quite across the river, I think. There is a race cut on the east side that the dam runs across so as to run the water in this way, so as to make this mill race up here. Yes, sir, it was built for the purpose of turning the water into that mill race. Yes, sir, it extends clear across, except that portion used for a mill race. It runs up against an island and the race is cut down in a low place and it runs water down there.

8295 As to how many places there are where the river is wider than it used to be, I will say there is a place up here where it has filled in. In times of high water it is wider. Right at the north end of the town here there is a little made land, but right opposite

the town here the river channel is practically the same as it used to be. There is not a great deal of difference in the town site. I don't remember whether the years 1884 and 1885 were known as wet years. I don't remember the special years when we had a great deal of rain, but I know there was high water at that time. I know they swum some cattle across here, several droves, but I couldn't say what year that was. I think the river did overflow its banks and get into the bottoms in some places in those years, not what we could call a general overflow. As to the first general over-

8296 flow, I can't fix the dates. There was an overflow before I came here when they said the river was three miles wide, but I never saw that, and here last year there was a flood. As to whether I saw anything to show me that there was an overflow before I came here, in the way of driftwood or other deposits, well, I could see where they told me the water had been up on the trees, and I have seen the marks of that. The river bed in the last year, as to the flow of water, has been a little light right here through the high water of last year. Now, here in harvest, we had high water then. Yes, sir, we had high water about the first of July last year, I think, and we have had high water in the last month or two. Yes, we have had a reasonably fair, steady flow of the river for the last ten months. Yes, sir, as good a flow as we usually had for the last few years. At the present time it is down. As

8297 to how wide the river is at the present time and how deep it is, on an average, I have not been to the river in three weeks, and when I was there last it was up bank full or what we would call bank full, and that was right through here. I was over here where there was a sand machine set and it was bank full. I don't know the distance across the channel there, but it is something like 700 feet, I should judge,—six or seven hundred feet wide, and, on an average, I think I could wade it. In some places it might be four feet deep and in some places five and in some places not more than a foot or a foot and a half. At the time I saw it I guess it would be on an average about three feet. I would judge it would.

Yes, sir, I came from Illinois to this State, from Macon county, ten miles south of Decatur, and I was born there. No, sir,

8298 I don't know as I have a distinct recollection of the streams there in my boyhood days. I didn't go fishing or swimming then, and I haven't any very distinct recollection of them. I never was around them much. I paid little or not attention to the streams, and I didn't notice them particularly when I was back there on my visit last year. I crossed the Sangamon river when they were putting up ice, and I couldn't say whether there was as much water in those streams of late years as in the earlier years.

Redirect examination.

By Mr. ASHBAUGH:

As to how the flow of the river was here last September and October, I won't be right positive, but I think it was rather light. The

river bed is leveller for the last year or two than I have ever
8299 seen it. (Objection.) It is leveller all the way through.
(Objection.) I think it was low last year in August and Sep-
8300 tember. I don't know that of my own knowledge, but at the same time I have hauled sand out of that river, out of a bar right down here, and I know the water would run up there once in a while and run down again, and I know it was low. It was awfully low last summer and fall, yes, sir, and once in a while there was high water.

8301 W. F. MAINS, Oxford, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Oxford and came here in 1884. I have been here in Oxford for five years last past. I lived with my brothers-in-law up the river. Yes, sir, I am a brother-in-law of Mr. Shore and Mr. Overley who testified here this morning, and am a brother-in-law of Mr. A. J. Shore who testified at Winfield in this case three or four weeks ago. I worked for my father-in-law the second year I stayed in this country. Mr. A. J. Shore has a farm on the
8302 west side of the river but he lives on the east side, and Mr. W. L. Shore lives on the west side of the river. The farm of Mr. A. J. Shore, during the flood of last year the high water was all over it and it was up in his house. This was the flood of July, 1904. As to how the flow of the river during the last ten years, exclusive of floods, compares with the flow of the river for the same seasons of the year during the first years I knew it (objection), I will say, it has been real low. As to islands, I have noticed quite a few changes in the river by the islands in the river. When I first came here in 1884 there were two small islands right where my father-in-law lived, and one of them I suppose had three or four acres in it and the other one an acre and a half, maybe, and now they all run together, or almost together, and they claim there is about thirty acres in the two islands. It is all heavy timber, some of it
8303 not very large and some of it large. As to how long the river has been low in comparison with the early years, I will say, in the last fourteen years I have noticed it being lower. As to what fixes that in my mind, I lived on the river and worked for the boys right along the river all the time. As to the carrying capacity of the river now compared with the carrying capacity in the early days, the water being at the same height as judged from the banks, well, it is not nearly as high as it was at that time, and the carrying capacity of the river to carry off floods is not nearly as great as it used to be. It has filled up, and the banks are not so high. The channel is not as wide as it used to be, and there
8304 is made land along there in places. (Objection.) On some sides of the river land is made and on some sides it is washed

out considerably. The amount that is made is greater, to my knowledge, than is lost. The place where I worked on the river is about five miles above Oxford, and it is a mile and a half above the mouth of the Ninnescah.

Cross-examination.

By Mr. HAYT:

My father-in-law's name was C. C. Shore. He is dead now. Yes, sir, I am pretty well acquainted with Mr. Canfield, and the land I am speaking of belonging to Mr. Shore is about two miles from Mr. Canfield's place. His place is two miles south and half a mile west of Mr. Shore's. Mr. Canfield's is lower down the Ninnescah river.

8305 As to how the crops have been up there during the last seven or eight years (objection), I will say part of the time they have been fair and part of the time they have not. They have not been so very good in the last seven or eight years. I don't know about Mr. Canfield's crops, whether they have been as good or not for the last seven or eight years. I haven't paid as much attention to his as to the others, because I was there oftener. No, I couldn't say that Mr. Canfield's crops have been any poorer during the last eight years than during the previous years. No, I don't know

8306 as a matter of fact that they have been just as good. (Objection.) Yes, sir, I have been by them frequently and I have harvested wheat a time or two on Mr. Canfield's land. I think the last time was about seven years ago, and that year he had pretty fair crops. It averaged up well, yes, sir, that year it did. And then four years ago I harvested some there and he had some pretty good wheat and some that was not so good then, but it averaged pretty good, yes, sir. As to whether I ever heard any complaint from him that his crops were not as good of late years as during the former years, I never heard him say anything about it. I worked for his boys. They were running the place. Yes, sir, I said that Mr. A. J.

8307 Shore's land was flooded last year. I don't think it was flooded to amount to anything before that time. Not in my time here. No, sir, it was not flooded in 1884 or 1885 that I know of and it was not flooded until last year that I know of. Yes, sir, I know that previous to last year they had some very great floods in this country, but never had any to my knowledge like this was. As to whether I know that driftwood is scattered around the river bottoms, that was left there during the earlier years, that was before my time here. As to whether that indicated to my mind that they had high water during those earlier years, I would say I never heard anybody say anything about it. I don't know as I ever saw any of that driftwood. Not before this time. I work over there occasionally putting in curbs and I see it from last year.

As to the water in the river now, it is tolerably well filled up.

Yes, sir, it is a pretty good river at the present time, and it
8308 has been a good river for six weeks, but still it went down and there was lots of sandbars shown, but there was a good flow of water. As to its being a good flow of water since last July, I will say it got down pretty low this winter. It has averaged better than it has for the last two or three years. It has been a pretty good average flow for the last year, yes, sir, but nothing like it has been before that. Yes, sir, the river bottom has filled up and the banks are not so high as they were heretofore. The bottom has filled up and the water in the river has raised accordingly, yes, sir.

Redirect examination.

By Mr. ASHBAUGH:

During September and October of 1904 the river was pretty tolerably low, so that you could ford it most any place you would
8309 drive in, and by that I mean so that you could cross it without its running into your wagon box or anything like that. When I first came to this country you couldn't ford it in any place you came to it.

8310 SILAS THURLOW, Oxford, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live six miles south and two miles east of Oxford, and I came here in the fall of 1870 and have lived there continuously since 1875. My house is pretty nearly half a mile from the Arkansas river. I have about 550 acres of land, and over half of it is bottom land. As to the flow of the river for the last ten years prior to the high water of last year as compared with the flow of the river during the first ten years, excluding floods, I will say the water has not been in the river, because, now, in these later years it is filled up with sandbars and islands and brush that were not there at all in
the earlier years, and the water is not there. The flow has
8311 been less there, because it has been filled up with brush growing in there and catching the sand, and the channel is not there.

As to the flowing capacity of the river, it is not as great as it was in the early years, not to my knowledge.

Yes, sir, I think I know what is known in this country as the underflow. As to how far back that goes from the river at my place (objection), in the early days I dug to make a well and drove a sand pump, and the sand would fill in that screen and I would have to dig down to see if I could get the screen in coarse sand so that we would have no trouble about the water, and I dug down to see about it, and wherever I struck that quicksand the water was there just the same as near the river in the quicksand. And that was close to

the foot of the hill, nearly half a mile back from the river. As to whether the underflow would rise and fall with the con-
8312 dition of the water in the river (objection), well, I think the river—as the river rises that rises. Right now while the river is up the water comes up there to the ground and runs into my field, and as the water backs up it just forces it up there, and that is all of 80 rods from the river right now.

Cross-examination.

By Mr. HAYT:

Those rises of the river force it up through the ground that way. This rise we have in the river now, it is just going down now. The rise was two weeks ago or a week ago. I don't say that we have had pretty high water for six weeks. The river has been rising and falling all spring. It has had a good stage of water all spring. No, we haven't had pretty high water for six weeks. As to how long we have had it, I don't watch the river all the time. It raised last night. Yesterday I was working down there and went over on a sandbar to let my horses rest and this morning it raised and
8313 went over that sandbar. It raised a foot and a half last night, or a foot, and it goes up and down that way. It comes up when we don't have any rain here at all, away over the bars, and in a few days it goes down. Yes, sir, these rises in the river come quite suddenly at times, and that has been a characteristic of this river for a great many years, yes, sir. As to how far it was down to water in that well I spoke of, of course now it was just back a quarter of a mile. It was not less than five feet, nor more than six and a half feet to water. I just drove this pump down there and then I went to make a well and I dug down, you know, to make a well, and didn't do it. I dug into the quicksand. I think that was in 1877 or 1878—something like that. As to whether I sank that pump deeper after a while, I will say I quit there and didn't get through. I went out in the bottom lower down and dug down in the sod there and put a barrel in there and dipped the water out, and I could dip up two buckets of water and let it stand ten minutes and dip up two bucketsful- more, and when the river would rise the water would rise in that place.

8314 As to the river say from 1870 to 1880 as compared with the water in the river from 1880 to 1890, I will say I was not here in 1873 and 1874. I believe those were the years I was not here. Well, sir, there is not as much water in the river now in these later years as there was in former years, and as to when I first began to notice the decrease, I noticed it only in our crops. I have always had a good crop up to four years ago, and then we didn't raise scarcely anything. As to whether I first noticed the de-
8315 crease in the flow of the river four years ago, I will say, well, for the last few years—now, I don't say now many years it was, but I know just one season was four years ago. I recollect that all

right enough. But these later years we haven't had the water in the river. I don't just know how long it has been but I know these later years the channel has been filled up with brush—cottonwoods and willows. As to whether I noticed any decrease in the water between 1880 and 1890 as compared with the years between 1870 and 1880, I will say we haven't had the water in these later years. In former years we had plenty of water in the river all the time, apparently, with the exception of a year or two and then there were good crops. We seemed to have the underflow, you know, and had the crops. Yes, sir, we had dry years in some of those earlier years when the river got very low. We have always had good water down there in the river. No, sir, it didn't frequently go dry in the earlier years like in these later years. Yes, it got low last summer, but not in the
8316 earlier years. No, I didn't pay any particular attention to it in those earlier years, not to be particular how low it got. As to how the flow has been for the last year, I will say I have not been watching that river. I know we haven't had the water in it that we formerly had. It has been pretty plenty in the river this season, so far along. I think it was pretty low last summer, the latter part of the summer. I don't know anything about having a flood in July. I don't particularly remember about the river. I have not noticed the river particularly from year to year to pay any particular attention to it. I expect I was down there a hundred times last summer, but didn't mind very much about it. My land goes right down to the river and I go down there and go by it but don't pay any particular attention to it so as to call my attention to it so that I could swear right square to what it was.

As to my saying it has affected the crops in the bottom lands, that is the way I noticed it more than any other way. Yes, coming to think about it last year I guess we did have some water.
8317 You see that leaves my mind, and maybe I will go out and meet one of my neighbors and I can't think of his name for an hour or so. But of course now last year it cleaned us out pretty nearly entirely, all along. Where it never before was it swept things away last summer. We had lots of water last season, yes, sir. My crops were good up to the time they were all swept away last year. My wheat was good on the bottom until it was all swept away, but my corn was not good because it was too wet for it to grow.

No, sir, I can't remember what kind of a crop I had in 1903. I don't mind it now. When you commenced to ask me about last year I never thought a breath about the river being so high. It is now, after it comes to my mind. Yes, sir, I can remember
8318 now that we had a pretty full river. And then the year before our wheat was good. Yes, sir, we had a fair crop on the bottom lands in 1903. I believe it was that year. It was 1904 I think I said we had none at all. It washed out with high water. It was four years ago I said we didn't have scarcely anything, in fact we didn't have any corn to amount to anything. We didn't get the rain four years ago. We had some, but I know we didn't get the usual amount that year.

Redirect examination.

By Mr. ASHBAUGH:

As to how the flow of the river was during the months of August, September and the first of October, 1904, I will say it ran down, but I don't know how low it got. I have been down there on those bottom lands all these years and I have always had a fair crop,
8319 if not a good corn crop, up until these later years, and especially four years ago. As to what I attribute the fact that on the bottom lands we can rely upon raising a corn crop, I will answer, well, we always laid it to the underflow of the river. As to whether or not that does materially assist in the raising of a corn crop even though the rains are insufficient in themselves to mature a crop (objection), I will say we have had the crops.

Recross-examination.

By Mr. HAYT:

Well, I have had good corn there in the low grounds when I didn't have scarcely any on the upland right close by. As to how our crops have been on the uplands in the last three years, I will say our wheat has been pretty fair. Of course you know the crop—it is a good deal the way it is put in and attended to. But as to the yield in the last three years on the upland, I don't believe I
8320 have been raising corn on the hill. I had a little corn last year on the hill and I believe that is all I had for a number of years. I raise wheat and oats and apples mostly up on the high lands, and these crops have been fair for the last two or three years. Yes, they have been what you might call good. Now, two years ago the oats were extra, until the rust struck them. As to how the soil on the uplands compares with the soil on the bottom lands with reference to depth, I will say, down there with us there is a great difference in the land. I can't say that the soil is deeper on the bottom lands. I know of a well being dug down there until it was fetched up fifty feet and it raised nice blue grass where it was banked up around the house and the blue grass growed right fine where the dirt that was on top of the ground there dried out and didn't grow anything. And that was up on the hill, yes, sir. I don't know whether the soil is deeper up there or whether it is thinner. There is a great difference in the land down in this country here.
8321 I should say the bottom lands are more retentive of moisture. You can dig down on the upland and you can go down to dry dirt where it gets drier and drier and on the bottom you can go into that quicksand where the water is and there is nothing to hinder the moisture from coming up. As to whether the soil is heavier on the bottom so as to retain this moisture, I would say the soil is very uneven on the river. In a strip of forty acres you couldn't get all the same kind of dirt. There would be a patch of heavy dirt and some that is more or less sandy. Yes, sir, it is more even soil up on the uplands.

8322 A. P. DOUGHITT, Oxford, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live six miles south and two miles east of Oxford, right on the river. My house stands about 75 rods from the river. It is built right close to the bluff, and between me and the river it is all bottom, and west of me are the uplands. I have 135 acres of land there. I have been on that place since 1879 or 1880. I have been on the river ever since I came to this country in the winter of 1871 and have been acquainted with the Arkansas river continuously
8323 since that year. I have been down the river as far as Geuda Springs, and my acquaintance with the river extends to Oxford, in this direction.

As to what changes I have noticed in the appearance of the Arkansas river since I have been here (objection), I have noticed this much: I will go back as far as ten years, and I may say the last ten years I have not raised as good crops as I did before. Yes, sir, I have noticed a change in the appearance of the river during these times. I can tell on my land and on my neighbors' there—I expect I have forty acres more land than when I got the place. Mr. Thurlow must have thirty-five to forty acres of land fenced in where the river used to flow in those early days. It is timber now and the river is filled up. The river channel along my place is no where near as wide as it used to be. I should think the river channel is about one-third less at my place. There is an island there
8324 where there was no island at all. It used to be so that I could and did keep boats there, in fact I kept boats to ferry across with, and my neighbors, and freight, and I can't use a boat there now at all. There is an island made out onto me there that you can't keep a boat there unless the river is away up, when it will run between this island and the land it is made onto, but the biggest part of the year there is no water in there. Yes, sir, these islands have increased in size in the last ten or fifteen years. (Ob-
8325 jection.) These islands have got bigger. There was no island there at all before and now there is an island there with big heavy timber on it that I have cut off for wood. I think that timber began to grow on that island about eight or ten years ago. I can speak of but very little above me, but I know it has filled up below me for a mile and land has been made in that time for a mile below me. As to how the flow of the river for the last ten years compares with the flow of the river for the first ten years, excluding floods (objection), I will say
8326 the flow is not as great right when we need it; that is, excluding flood periods. No, sir, it is not as great during the balance of the year for the last ten years as it was during the early years during the same period of the year. I should think that it was

two or three feet difference. My corn field is in the bottom. In the early days when I would lay my corn by in June and July, in August the water would seep up through that corn field. The last of July and the first of August. And it has failed to do that the last few years, and I would always have corn whether there was much rain or not. This last spring we had it very dry here. The water seeped up when the river was up and came up into my corn field in the center of that field until it was too wet there to plow. That water came from the Arkansas river. It pushed right up
8327 through the ground. That is what I called the underflow, I suppose. It is not water from rains at all that bothers me here. If the river is high it pushes up.

As to the carrying capacity of the river now compared with the carrying capacity of the river twenty or thirty years ago, the water being at the same height as measured from the banks, I will answer, the river can't carry water today as it did then, because there is not the space for the water to get through. It has filled up with islands. On my place I didn't have any timbers, scarcely at all, when I got it, and I have got lots of timber now, and this is all made land and timber that has grown ever since I bought the place. As to how far back the underflow goes, I will answer, it goes to the bluff. My house is 75 rods from the river. And why I tell you this, I have three pumps and there are none of my pumps over eight feet to water right close to the bluff, and that is all of 75 rods from the river. As to whether it goes back in other places, I will say I suppose it does across the river. I am on that side where there is a bluff and it is a rocky bluff there, and I don't suppose it goes back of that, but it goes out on the east side of the river.
8328 As to what advantage it is for us down there to have the underflow in the raising of corn (objection), I will answer I think it is a big advantage to me to have that underflow. As I told you a while ago, I had a crop of corn whether I had much rain or not. When we laid corn by in July and the water seeped up through that the last of July and August, I have neighbors there that will tell you I always had corn, and it would burn up on the uplands, but since I don't get the water that will burn up on me quicker than some on the upland. As to whether the underflow has fallen in recent years from the level that it maintained during the earlier years (objection), I said a while ago that it had. I should think there is two or three feet difference, just guessing at it, of course. Yes, sir, we had a flood in 1904, and during the
8329 latter part of the year the river ran down. Taking the year 1904 round, I would say that the flow of the river was uneven.

Cross-examination.

By Mr. HAYT:

As to when I first heard of this case, I will say all I ever heard I saw in the papers, and I can't tell you how long ago. A year or

two ago. I haven't been talked with at any time only today over the 'phone by anybody, and some people in this town told me to come up. Mr. Sommerville was at my house Monday. I was down to Kansas City and never saw him, though. I suppose he was there for the purpose of getting me as a witness. No, sir, I don't know of any reason why I was not called by the State of Kansas at the time the complainant was introducing evidence in chief. I don't know of any reason why I was called today even.

8330 I join places with Mr. Thurlow. He owns two places north of me and two south of me.

There were no islands along the river there where we are at all, you might say, in the early days. If the river was down low there would be sandbars. They would always be covered as the water raised a little, but now there are islands that the water don't get over unless it is a flood like last year. Yes, sir, there is one island down below my place, one that was under, pretty nearly, last year. A family lived on it. Yes, sir, that island has always been there. I don't know anything about another island up above Oxford. I should think it has been ten years since I have noticed the change in the flow of the river—since 1895 or somewhere along there.

As to how the crops were in 1896 and 1897, I know they have not been as good as they were before, but just to name any year, I can't tell you. Last year I was drowned out. I had no crops at all. I had too much water last year. I lost trees there that

8331 were twenty-five years old, full of apples, and grapes and everything else and my neighbors there were in a good deal the same fix. In 1903 my crops were fair. No, it was not an average crop, mine wasn't.

As to the value of my land now compared with the value when I first located there, that is a pretty hard question to answer. The value is what it is worth, I reckon. I don't know what you can get for the land. When I bought the land in 1878 or 1879 I gave $700 for it. As to what it is worth today (objection), as I told you, I haven't set any price on the land at all. In my opinion it is worth more than I would be willing to take for it. I value it as high as $40 or $50 an acre. Land around me has gone up that way,

8332 and I don't see—— This land generally in this vicinity has gone up within the last four or five years, on the upland as much as in the bottom, if not more. As to the rate of increase in the value of bottom lands in the last few years, I will say it is not as high as it was. There are lots of us on the river lost our crop last year, and as I tell you, we haven't been raising as good crops as before, but there is not so much demand for the bottom land now right in the neighborhood as there was formerly. As to whether the bottom lands are not worth now more than they were four or five years ago, I will say, yes, sir, they are. Taking them all together, they are worth more than they ever were before in the history of the county, yes, sir, because the improvements on them are

bound to make them worth more if the land is not worth more. No, I wouldn't say that increase has come about largely in the last four or five years. It has been coming all the time. Yes, sir, there has been a more marked increase in the value of farming land, both bottom and upland, in the last four or five years. There have been more buyers around and more demand for the land, yes, sir, and the prices I think have gone up accordingly. As to what up-
8333 lands are worth in this viciniiy (objection), I can't answer that question when there is not a foot of land to be sold there and nobody will set a price on it. I haven't got a neighbor in there that will sell, and I don't know the general value of the uplands. When a buyer comes to a neighborhood and they will not set a price on it, I can't see how I can tell the value of it. As I just told you a moment ago, I think the value has increased on the uplands as well as on the bottoms, and I don't suppose you could buy a piece of up-
land in there at less than $40 an acre. I don't think you
8334 could buy it for that. Yes, I consider $40 an acre a fair price for the uplands. As to the value of bottom lands, of course I am in the bottom. I think the bottom land is as good as the upland. I am not sitting here to run down my own land. As to whether I think the bottom lands are worth more than uplands (objection), if I had to farm them I wouldn't think so, just for what I could get for it, because I have the wood and water there handy and I could attend to more upland than bottom land. I should think, though, the average value of the bottom land would be about $40, about the same average price as the upland. Some of my neighbors might not think my land is worth that, but I am giving you my opinion.

When I came here in 1871 we had good crops, but not right on this place, not that year. 1874 was grasshopper year. No,
8335 sir, 1871 was not a dry year. We raised good crops in there right along up to grasshopper year and the water in the river was high enough to be crossed in a boat about all the time in 1871. As to when I first noticed in those earlier years that the water was lower than usual, I will say I began to notice it about ten years ago. We had dry years from 1871 to 1880, yes, sir, but then the river would rise, and as I tell you, I would make my crop in the bottom in spite of dry weather. Yes, sir, we had years of drouth and years when the water in the river was low during that period from 1871 to 1880. The water would be low, but still the June rises would back it up when we needed it. Sometimes more than it has the last few years. As to whether these June rises I speak of were common to this country, and to the Ninnescah the same as the Ar-
kansas river, I will say I don't know anything about the
8336 Ninnescah, but I know the river would come up the latter part of June and we always called it the June rise. No, I don't know whether that was true of any of the other streams in this country and whether they were higher in June than during the other months. I don't suppose they were, though, only when the

rain was. I think in these small streams the June rises depended on the rainfall, but I don't think they did in the Arkansas river. I think it came from the snow in the mountains in the Arkansas river. If there was a rise in the Ninnescah I would attribute that to rains, just as I said, but if it was in the Arkansas I would attribute it to snow in the mountains.

Yes, sir, you are correct in taking it from my evidence that I am opposed to having this water used for the purpose of irrigation in Colorado. As to whether I do not want the water taken out of the river either in Colorado or Kansas for the purposes of irriga-
8337 tion, I will say yes, I do, if you will take it out at the right time. As to whether I am opposed to the people of Colorado taking it out for the purposes of irrigation, I will say no, if you will take it out when there is plenty of water I am not opposed to it, because I would have been glad to have had part of it taken out last spring and this spring. During flood periods, yes, sir, I am willing it should be taken out, but not during other periods. As to whether the taking of the water of the river for the purposes of irrigation has the same effect upon me whether it is taken out in Kansas or Colorado, I would suppose it has, if it is taken out above me anywhere. As to whether I would have the same objection to the use of the water for irrigation in western Kansas as I would to the use of the water in Colorado, I would answer, if you took it out in dry times, yes, sir, I would; that is, when we need the water. As to whether these floods come down the river suddenly or otherwise, I would say no, I think we had a fairly long one last year and it kept running all over the country. Yes, sir, the rises come quickly and
8338 run off quickly as a rule. I have seen it when I went to town and came back at night and couldn't get over the river. I would ford the river in the morning in coming to town and sometimes they would come suddenly and I couldn't ford it getting back, and sometimes they would remain up quite a while—sometimes two or three days and sometimes longer. No, sir, I have never made any investigations on the east side of the river. I think the underflow extends on the east side to the bluffs. Yes, sir, on the east side of the river where we are it is more than as wide again as it is on the west side right there. No, I am on the west side of the river. The bottoms are bigger right across from me until you get down about a mile and then there is no bottom on the east side. It is all on the west side. But I have made no investigation on that side, no, sir.

Redirect examination.

By Mr. ASHBAUGH:

8338a Yes, sir, I object to taking water out of the river above for irrigation if they take it out during the dry season. That is what I answered counsel. Yes, sir, I think taking it out during the dry season is an injury to me. If they should let the water flow

as it normally flowed during the dry season but should take the floodwaters and put them in reservoirs and then use the flood waters for their irrigation during the dry season, that would serve their purpose and not injure me. Yes, sir, that is what I mean. (Objection.) No, sir, I consider it would be a benefit to me for them to take the water during the flood season of the year. As to the productiveness of my land being as great as it was when the
8338*b* river was larger during the dry season of the year and when the underflow was nearer the surface of the land, I will answer, it is not as good.

I have had no experience in irrigation at all. I don't know anything about how it is conducted.

8338*c* JEREMIAH PATTERSON, Oxford, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Beaver township, Cowley county, Kansas, six miles south and two miles east of Oxford, and within 100 rods of the Arkansas river. I have lived there twenty-one years. I have been in Cowley and Sumner counties twenty-nine years, and most of the time not over a mile and a half from the Arkansas river. During these twenty-nine years I have most assuredly been familiar with the Arkansas river. As to what changes I have noticed in the Arkansas river during that time (objection), Walnut river is not nearly as large as it used to be. It has not got the water. It is nar-
8338*d* rowing down and filling up on the edges and growing in from the sides. Timber is grown in places where there didn't use to be any timber, and the stream is not nearly so wide, nor so deep, because we ford it a good deal of the time at any time of the year excepting floods, and it used to be so that we couldn't hardly ford it at all. As to the carrying capacity of the river now compared with the carrying capacity when I first knew it, the water being at the same height as judged by the banks, oh, it is no where near what it used to be, because it used to be a steady surface of water there and now half the time in places it isn't two rods wide where it used to — forty rods wide. Well, I will not say forty rods, but thirty rods wide, covering all of the sand bed. As to when I first noticed
8338*e* this decrease in the flow of the river, I will say, well, I don't know. But ten or twelve years, or maybe a little more than that. It has been decreasing for several years. As to whether that decrease came all at once or came gradually, well, I think it is getting lower all the time as a general thing. With the decreased carrying capacity of the river, as to what would be the result if the same amount of water should come down that came down in the early years filling it bank full (objection), well, I used to take particular notice of my neighbors' there. I only take it from observation, because I don't own bottom land, but I have seen where we used to

have burn outs on the hill there on the upland, and they would raise corn at sixty or seventy bushels to the acre. Now, burn-outs mean that we don't have any rain and they wouldn't have corn at sixty or seventy bushels to the acre on the bottoms. As to why they get good corn on the bottom lands when we don't have any corn on the uplands, it is because the water was right there close to the
8339 roots of the corn, is my opinion of it, for I went down there through that bottom land two or three times and would take a spade and see how near the water was in the cornfield. We would sink a spade down deep and come to water. That water came from the river. It is what we call the underflow. As to what benefit the underflow was to the raising of crops on the bottom lands in the early years, well, just as I said, they had corn there that would make sixty or seventy bushels to the acre when we didn't have corn at twenty bushels on the hill. As to how it has been within the last five or ten years, well, four years ago the bottom land burned up before the upland burned up.

As to how far back the underflow extends from the river (objection), well, I live on the hill and I have a well eighty-five
8340 feet deep and you can pump it day and night all the time, or a windmill can run it, and when the river is up the flow from that well is a heap stronger than when the river is down. Now, that well goes through to the river, because it went through this layer of rocks that is talked about and as soon as it went through that it dropped the drill about ten feet down and we commenced to pump this yellow quicksand up, and this was the same sand, and that is back there close to a hundred rods from the river. There is no doubt about it that the underflow extends back at least to the uplands, and that would be from seventy-five rods in some places to a mile and a half.

If the carrying capacity of the river is not as great as it was in the early days, as to what effect it would have upon the bottom lands if a volume of water came down the river now that would have filled the river in the early days bank full (objection), I will say I don't know. It would have to fill the land all full before
8341 it would overflow, clear to the bluffs, that is all. It would just fill the ground first. It would be a great blessing to the people in the bottoms to have that flow. (Objection.) Because that land that had raised seventy-five or eighty bushels of corn
8342 to the acre years ago today will not raise as much corn as my land will on the upland, because they don't get the water because of the lack of the underflow. Yes, sir, there is no question about it.

Cross-examination.

By Mr. HAYT:

As to whether I have made any study of this underflow, I will say I have worked some on the bottom land and rented some some

times. As to its being my theory that it extends out under all these bottom lands, I will say we find it out there all around. Yes, sir, I stated that I sank a well on the uplands and found the underflow at eighty-five feet, and that was the same underflow that we had in the bottom lands, the same thing exactly. As to whether if you would go four or five miles on either side of the river and go deep enough you would strike that same ground water or under-
8343 flow, I would say it seems as though it has been pretty nearly the case in some places now. We strike that vein of sand and there is the water. Yes, sir, wherever they strike that vein of sand they strike the water, and it is a steady flush of water and you can never pump it dry. As to how far they have struck that vein of sand from the river, of course there are none of them very much farther from the river than I am, not over forty rods farther, any of those deep wells that are sunk in my neighborhood. As to whether if you would go out two or three miles from the river you would expect to strike that same vein of water if you should go deep enough, I don't know whether we would or not, because I haven't tried that. But in my judgment I hardly think you would. Still I don't know. Yes, sir, my theory is that this underflow is all supplied by waters from the river. As to what becomes of the rains that fall in this country, of course they help sometimes. How do those people raise good crops down there without any rain, or used to, when we would burn up on the upland? Now, today we don't burn up as quick as they do in dry times when the water is down in the river.
8344 Well, that is my theory about it. I have been watching them burn up now for the last five or ten years there.

Yes, sir, the cultivation in this country has largely increased, so far as the acreage is concerned, since I settled here, and with the cultivation of the country the soil probably absorbs more water than it did in its original condition. As to where the water goes that sinks into the ground, I don't think it goes to supply this underflow, no sir. I think the vegetation and such things as that take up the rainfall. I don't think any of it goes into the underflow. I don't think it has anything to do with it. As to whether that water got back into the river before the vegetation, I will say, there has always been vegetation here, but before cultivation a great deal of it went to the river. There would have been a great deal larger run-off then, certainly. When the water comes down the
8345 river in flood times it surely does go first to fill up this underflow before it goes out of the banks. Yes, sir, it must fill that underflow before it ever gets above the banks. And if that stratum of sand I speak of extends a mile or two on each side of the river the river must fill that full before it can get over the banks, yes, sir. Why, we have ponds out there a mile and a half from the river that you can watch and you will see that rise up and down as the river rises and falls, any time. I don't know whether that condition exists out five or ten miles from the river. I don't know how far out. But if that same condition should be found to exist five or ten

miles from the river, as to whether it would have to be filled up before the water would overflow the banks, I would say if the water could work its way out through that sand it would surely get through before it would ever raise above the banks. As to whether I would expect any overflow until the sands and gravels on either side have been filled up to the level of the top of the river bank, I would say I have been noticing it for twenty-five years and we don't have it down there until after the place is filled up—until the land is full of water it never overflows the banks. As to whether
8346 the rains in Kansas have any effect on the underflow, I would say it may raise the river some but it will never put the river out over the banks until the ground is full of water down there, surely. I have worked enough in this mud to know just what it will do.

Yes, sir, the Arkansas river has a large drainage in the State of Kansas. It surely does drain a large area. As to whether much of this high water that comes here when we do have high water comes from the drainage of the Arkansas river within the State of Kansas, that may be the case. I don't know just exactly where it comes from. All I was speaking about is, you have got to have the ground full of water before she will put it out over the banks in an overflow, and it will show itself away out from the river, wherever there is low land, lower than the banks are—the level of the water will show itself out there before it will ever come over the banks.

Yes, sir, they have been cropping the bottom lands to corn for a great many years here. That is their main crop. They have
8347 been putting those lands into corn for twenty-five or thirty years. They may sometimes change the crop, raising wheat, oats and such things, but they are so much better for corn that they generally raise corn. As to whether that would have the effect of reducing the productiveness of the land, to crop it year after year to one crop, I will say, I can't see why. As to whether in my judgment as a farmer it is necessary to rotate corn with any other crops, to get the best results, I think it is a little better, but when a man is putting under vegetation there that teams can hardly walk through, year after year, this land is bound to be richer today than when it was broken up. And by putting under vegetation I mean weeds and everything else that they put under in the cornfield. As to whether they allow them in the cornfield, I will say some of them will grow sometimes in wheat fields, after the wheat is cut off anyway. As to whether as a general proposition the raising of any crop on the same ground for a number of years will deplete the soil so that that crop will not grow as abundantly as if the crops were rotated, I will say there has been a great theory of that kind, but I have known land that has been kept steady to wheat for twenty-five years that raises twenty-five bushels of wheat yet. As to whether
8348 I take any stock in the theory of the rotation of crops being necessary to successful farming generally, I think it is better to change it sometimes. I do it about every third crop. As to

whether that is a pretty good indication that I think it is a good thing, I will say I like it anyway.

Yes, sir, by saying that crops were burned out I mean that it was done by these hot, scorching winds that we have had sometimes in this country. We have known of those winds burning up crops on the bottom lands as well as on the uplands. That happened four years ago and at other times, yes, sir, but I can't just mind the year, but two or three times, when they have been—when those hot winds came through hot and scorching and burned up the crop clear to the edge of the river. They burn them up more or less. A good deal of it had to do with the stage of the water. Now, out where the bottom land was raised a little higher and the river wasn't sufficient in flow to keep that filled up, there is where it burned up first. As to whether these hot winds sometimes come through

8349 the country here and burn things up in two or three hours if we have a good deal of dry weather, they do, yes, sir. I don't know about it in two or three hours, but they burn it up by degrees. I have never had any burn up in that length of time, I believe. I guess it takes a week or ten days, probably, to get them. Of course I have seen them burn in probably two or three days' time. As to whether those dry winds are as frequent of late years as during the earlier years, we have always had them, I think, more or less. In some years we have had very little of them. As to whether they have been of less frequent occurrence of late years than during the earlier years, no, I think the last ten or fifteen years they have been worse than we used to have them. Yes, sir, worse than in the earlier years. No, I don't think the country is growing any better in that respect. I think we will always have them. As to whether I take any stock in the theory that the cultivation of the lands and particularly the opening of the lands in the Indian Territory and Oklahoma has had the effect of lessening the hot winds and the destructive drouths in this locality, no, sir, I do not.

8350 The water in this river has been pretty high some of the time during last year, more than they wanted. Yes, sir, it has averaged pretty high as a general thing. Well, it ran down last fall some. It went down pretty low last fall. I don't mind, though, just exactly what the stage of water was then. I wasn't thinking much about it.

As to how many bridges there are in this locality across the river, there is one in our neighborhood and one at Geuda springs, and one in this town, and two or three at Arkansas City—three anyway. Yes, sir, I am speaking of wagon bridges. As to the number of railroad bridges, there are two here, and I don't know how many there are at Arkansas City. There must be two anyway there. As to how the bridges here are built generally, in the way of driving piles in the bed of the stream, I will say most of them are, yes, sir, and most of the wagon bridges are built that way too.

8351 No, sir, there are no other obstructions in the river above here that have been put in artificially that I know of. I don't

know much about the dam here at the mill. I know they have some kind of brush piled up there. I don't know whether it is a dam or what it is. No, sir, I don't know that there is a stone dam up there. I never was up there.

TOPEKA, KANSAS, June 15, 16, 1905.

8353 C. W. VEALE, Topeka, Kansas.

Direct examination.

By Mr. LOOMIS:

I live in Topeka, Kansas, and have lived in Kansas forty-eight years next July and have lived in Topeka forty-three years. I think I am well acquainted with the Kaw valley and its tributary valleys. I have been up and down these valleys for forty-
8354 seven or forty-eight years. My first experience in the Kaw valley was in the month of July, 1857, when I looked some land warrants up here in Pottawatomie county, on the Kaw river, between Wamego and St. George. Yes, sir, I became an owner of valley land. I entered it at the old Kickapoo land office and owned it from 1857 to 1887, and I have owned other lands in the Kaw valley, in the vicinity of Rossville, Shawnee county, eighteen miles west of Topeka, and I have cultivated these lands all the time. As to what crops I raise, my first experience was in raising wheat in the '70's when I farmed extensively. I raised wheat for a number of years and raised corn all those years, and have raised corn ever since. I am still farming. Not so much in the Kaw valley as on Camp creek, which is southeast of Topeka twenty miles, and on the Wakarusa. Yes, sir, I have been engaged in agriculture practically all the time since I came to Kansas. I think I am familiar with the staple crops raised in the Kaw valley since coming to
8355 Kansas. I have not only been farming and raising products, but I have bought and fed a great many cattle, as many as 600 head at a time.

I am familiar with the tributaries of the Kaw valley since 1865. Those valleys are the Republican valley, the Saline valley, the Smoky Hill valley and the Solomon valley. I went up the Republican valley with General Sheridan when we went to Fort Laramie in 1865, and then when I came back from there I was connected with the Union Pacific railway in the construction of that line from Junction City to Concordia. My first connection with the Union Pacific was in 1871, and it was then known as the Kansas Pacific. I aided in the construction of the road from Solomon city to
8356 Beloit, on the Solomon river, and from Salina to McPherson, which will be twenty-five miles up the Smoky Hill. I procured the right of way on those lines. I think I observed the valleys and the agricultural conditions pertaining to them when engaged in that work. I was interested in farming and the products

of the country, and after the roads were built I became tax agent of the road and paid the taxes of the road for a number of years, and this took me up and down the valleys several times a year at different seasons for assessments, etc. I have been a member of the Kansas legislature sixteen years all together.

As to the width of the Kaw valley through the State, there are places where I think it is as much as four miles wide, down at Lawrence, for instance. West of Topeka the widest place I know of would hardly be four miles. Possibly up here at Rossville
8357 it is very nearly that. On an average it is from one to three miles wide from here to the junction of the streams that form the Kaw valley, which is where the Republican comes in at Fort Riley. The first stream west of Junction City is Chapman creek. The streams that help form the Kansas river are the Republican, the Solomon, the Saline and the Smoky Hill. The Solomon enters the Smoky Hill near Solomon, and then it is still called the Smoky down to the Republican, where the Smoky and the Republican come together to form the Kaw, and the Blue river comes in at Manhattan The Smoky Hill and the Republican unite at Junction City to form the Kansas river. I understand the proper name for it to be the Kansas river—the Indians called it the Kaw when I came
8358 here. The Kaw and the Kansas are one and the same stream. West of Junction City Chapman creek is the first important stream, and the next the Solomon river which unites with the Smoky Hill at Solomon City, and west of that is the Saline. The valley of the Smoky Hill, as to width, would be from half a mile to a mile and a half. The Saline valley is a little wider, and its maximum width would be from a mile—in some places it is more, in Saline county especially. It widens out there. Its maximum width I would say would be a mile and a half, and its average width a mile, and the Smoky Hill would be about a mile
8359 wide on the average. The Solomon is much the same. There are some places it is wider. There are some very nice valleys indeed along up the Solomon, possibly two miles across them in places. That would be a sort of second bottom, you know, and yet it is beautiful fertile land. The Republican valley is wider in places and more sandy, and at its maximum would be a mile and a half, and its average width, I think, would be a mile and a half, up as far as Concordia.

As to whether there has been any decrease in the flow of the water in the Kansas river, taking it year in and year out, since I first became acquainted with the stream, I will say no, I don't think there has. I think if any change there has been an increase, possibly. (Objection.) As to whether there has been any narrowing of the bed of the stream since I first became acquainted with it
8360 (objection), I will say no, sir, I think not. As to the flow in the other streams I have mentioned, as to whether there has been any decrease in the flow of the water in those streams since I first became acquainted with them, I will say no, sir, there hasn't

been any decrease. I am satisfied of that. The streams have been higher of late years.

As to the productiveness of the soil in the bottom lands of the Kansas valley and its tributaries at the present time, as compared with what it was in the early '70's, well, we raise just as good crops now as we ever raised. Not every year, however, but the productiveness of the soil is equal now to what it was then, where it has been kept intact and treated properly.

8361 As to when I first became acquainted with these valleys, I began to farm in 1871; I became a settler ten years previous to that; but my farming experience on that bottom farm has been about the same all the time. It varies some as farming does everywhere. In some years I got better crops than in others, but I still raised good wheat and good corn, and I think the land is as good and worth as much per acre. As to whether I can produce as much corn and wheat per acre on those bottom lands as in the early years, I will say, oh, yes, I can do that. We do. That is done, yes, sir. We find no diminution, except as it may vary between the different seasons. Not on account of the soil. The soil is all right. If the statistics taken during a long period of years should show a gradual falling off over the State in the yield of corn and wheat and oats per acre, as to what I would attribute it to, I would answer, to the putting of the thinner and poorer lands under cultivation. When we first came of course we seized upon the best lands of the

8362 country, and they are the bottom lands altogether, and then we went onto the upper lands, and as we did that we took the second bottom, and so on until we got the worst. And now pretty nearly everything is under cultivation. There is a settler on nearly every quarter, and that brings into cultivation the poorer lands, and the floods wash them and the lands get thin, so that it brings down the general average of the crop.

Cross-examination.

By Mr. HAYT:

8263 The Republican river is a wider stream and has much more sand in it than any of the other streams I have mentioned, and the fall to the mile I would say was about the same. It drains the whole country, and the level of the country is rather gradual, you know. As to what I mean by saying that the fall is about the same, I mean by that that the fall of the Republican would be about as great as the fall of the Solomon or Saline, and that is possibly about four feet to the mile. The Republican river is a pretty wide stream. In places it would be about 300 feet wide. As to the average flow, I would say I don't know that I could tell that, for I have never measured it, but I have seen the stream pretty nearly dry in dry seasons. There has always been some running water in it, yes, sir. I think the stream is about 200 miles in length. I don't know just the length of it. And the height of the banks

above the bed is generally from four to five feet, and the banks are composed mostly of sand. As to the river bottoms on each side of the river, I would say the whole river bed of the Republican
8364 river is practically sand. Of course there is some soil in it. In places the banks are colored to that extent that they are dark, but when they come to cave in and wash away they show white sand. The depth of the soil on each side of the Republican is from three to four feet, and below that it is more or less of sand, but of course it is dark in places. I don't know how deep that sand goes. The average width of the bottom lands of the Republican river is a mile and a half or two miles. The Solomon river is the next one in order, and that is a deeper stream, with higher banks. It is a narrow stream, not so long as the other. It doesn't afford so much water, and the banks are twelve to fifteen feet above
8365 the bed of the stream. It varies in different places. In some places it may not be that. I don't know how deep the water is in that stream during the summer season. I never went in swimming in the stream. I don't know much about that. But it is always running water. The soil is not sandy there. It is good loam soil, in the bottom lands, and it is quite deep. The fall of this river is about the same as that of the Republican, I think, and the sources of supply are the same—the smaller streams putting into them and there are many of them, and they head around in the bluffs in the State of Kansas, most of them. Of course the Solomon begins right up at the Colorado line. No, sir, I couldn't give the drainage area of the Republican and also of the Solomon. I don't think I could. The next in order is the Saline,
8366 and that is not so deep a stream, quite, as the Solomon. It is much the same kind of a stream, however, and there is always water in the Saline. It is possible there are places where it doesn't run, but there is always water in the Saline river. There is some sand in the stream, but it drains a very beautiful and fertile country from Salina, in a northwesterly direction, and its length is about 150 miles. It is a narrow stream, just an ordinary creek. It commences away up in Wallace county near the Colorado line. Where it first begins there is no timber, and it acquires timber first, I think, down in Trego county. There is timber on the Saline in that county. The soil along the lands immediately adjacent to the stream is good, but I don't know how deep it is. In many places it is quite deep, you know. I should say it is as deep as the soil on the Republican. The soil is good all along the whole Saline valley, and is underlaid with sand, yes, sir. The bottoms along the Saline are half a mile to a mile and a half wide.

The next stream in order is the Smoky. That comes down
8367 through Ellsworth, Russell, Ellis, Trego, Gove, Logan and Wallace counties. It is sandy in the river all the time, and it is not a very wide stream. When it gets on a tear and gets over the whole bottom it gets out three or four hundred feet wide. It is from a hundred to 150 feet wide between the banks. I don't know

but they are possibly a little wider than that. The bottom lands adjacent are sandy. I have a ranch up there in Trego county, and up about a mile from the Smoky I have a large alfalfa field
8368 on Page creek. The soil there is two or three feet deep. I never plowed any down on the Smoky, but there is good soil there, but of course it is underlaid with sand. Yes, sir, I think it is true along all these streams. I think it is true generally. The bluffs run right up to the stream in many places, and opposite that bluff on the other side, you know, would be a large bottom. The bottom lands of the Smoky Hill river are not very extensive.

The next stream in order is the Blue. The Blue is the handsomest stream in this State and carries the most beautiful water—the clearest and cleanest water—of any stream in the State of Kansas. It heads up in the State of Nebraska about 175 miles, nearly up to Fort Kearny. I have been along up the Blue when I was a soldier in the employ of the Government. I don't think it is quite a hundred miles in Kansas in length. I am sure it is not a hundred miles. I have not a very good idea of its size. It is a nice stream, it is more than a hundred
8369 feet wide, that is, on its level when the banks are full from bank to bank. It don't afford a stream of water a hundred feet wide at this season of the year all the way up. At Manhattan I think it would, where it puts into the Kaw river. The banks are usually seven or eight feet high. The bottom lands are very fertile and very fine. They are wide in places and narrow in places. As to the average within the State of Kansas, they run measureably with those other streams, say a mile or a mile and a half wide, and these streams all have about the same fall per mile. Yes, sir, they are all very heavily timbered. In places they are and in other places they are not. There is timber all the way on the Blue. There is more timber now on these streams than when I first knew them. It has been cared for and protected from fire, and there is much more timber. Yes, sir, considerably more. I would
8370 say there is from one-quarter to one-third more timber now than there was forty years ago when I first knew the streams.

Yes sir, my experience has shown that the productiveness of the soil is about the same on these bottom lands, and as to the effect, if any, of the repetition of the same crop on the same ground, I know of fields here that have been in corn for forty years and there is very little variation in crops. All along this valley they raise corn every year. I don't think there has been any diminution in the strength of the soil by reason of its being overtaxed with corn. As to the productiveness being affected by the continuous growth year after year of the same crop, I think there is very little difference in the crops; they run pretty regularly. No, sir, I don't think it has the effect of lessening the crop production. I don't think it has. As to whether that would be true of the thinner lands—the uplands—I would say hardly. The thinner lands, you know, the more you plow and use them the thinner they get, therefore if they

are in pasture or clover or wheat they don't waste away so
8371 much. The practice of farming on the Kaw Valley lands is usually by "listing," and that is deep. They list altogether. They don't plow very much until they have listed the ground, and then they go to work and plow it with these little shovels and harrow down and then throw to the corn. As to what I mean by listing, I will say listing is done by a lister that goes into the ground and throws the dirt each way. It is not an ordinary plow that throws the furrow over. It stirs up the soil deeper than the ordinary plow, yes, sir. I should say it would reach from six to eight inches deep—about six inches. And that system of cultivation has been in force in this part of the State for the last eight or ten years. They used to plow altogether. As to whether or not it is found to be a better method of cultivation, I have thought sometimes it was, but if a man wants to do good farming he wants to plow his land. As to the
8372 character of these streams as to flood waters and as to what months in the year the streams are usually low and what other months in the year we expect high waters, I will answer, I will go back as far as 1859 and 1859. They were two of the wettest years we have had in Kansas since I have lived there. I was connected at that time with a steamboat that ran from Fort Leavenworth to Topeka, and we boated on the river, carrying products for the Government back and forth and up as far as Fort Riley, and then for a period of years we didn't do any steamboating. It got dry and we didn't have water. We never have had as much water in the Kaw river from that time up to two years ago. Yes, we had high waters every year, and I will name the months. We invariably get these rains in June and July, and sometimes as early as May. We have had the highest water about the 30th of May here that we have ever had since I have lived in the State. The other next highest was in July. But in 1903 and 1904 we had more water in Kansas than in any other two years since I have lived in Kansas.
In 1903 it came in the month of May, and in 1904 in July.
8373 Our months of low water are usually August and September.
As to what years were comprised in my answer when I said that during the earlier years we had plenty of water, during the years I was boating on the river, and that since that time there had never been so much water, as to whether I can designate that by periods, I will say that at different years we had, but not so steadily as we had that year. Well, I don't know as I can. We have had a good many years when we had plenty of rain that would keep the river full all the year round, but there has been an act of the legislature to declare the river unnavigable, you know, and they were prompt to bridge it so that we never steamboated any since those days. I was referring to the years 1858 and 1859 when I spoke of the large amount of water in the river. Following that, the year 1860 was the driest year we ever had.
8374 Then again 1874 was a very dry year. We raised nothing,

scarcely. Yes, sir, 1860 and 1874 were both very dry years, but there was always some water in these streams. Yes, sir, very little in some of them during a portion of the year. Plenty of water in the Kaw, the Blue and the Republican. The dry period extended through to the fall season in 1860, and in 1874 up to October, from June. In 1860 it was dry all spring, and it was a dry winter, and then we had very little rain in the spring, not enough to make the wheat grow. The result was that when we planted our corn we didn't get any crops, scarcely. As to whether I have ever had any experience in the State of Kansas to show me that there is a periodicity in the rainfall and in the drouths extending over a term of two or three years or any other number of years, I would say no,
8375 sir, I think not. There was only one year when we had a——
Two wet years are as many as I ever witnessed in my recollection, of great rainfall. I don't really know what the records show since they have been kept, but there appears to be plenty of rain in the State for all agricultural purposes, if it is properly distributed, so that we are not having any more dry seasons, so much so that we could not raise crops, since 1874. I would think that my experience does show that usually we have three or four years that may be termed wet years, not flood years but wet years, followed by a period of dry years, to a certain extent. The seasons don't run regularly. There are wet seasons and dry seasons. I don't know how they would run as to whether it would be two or three or four years, but we have more rain, of course, in some seasons than we do in others.

Yes, sir, I said in answer to a question propounded by counsel for complainant that I thought there was rather more water in the rivers of late years. As to what I attribute that increase to, I think we have had more rain. That is the general impression among the farmers, and that the rainfall in the State of Kansas, as a
8376 general proposition, is increasing rather than diminishing.
Yes, sir, we depend for the growing of our crops upon the rainfall, and for the supply of the water in the rivers, principally. I know nothing of the irrigation business at all. Yes, sir, for good wheat we depend upon the winter snow. I don't believe I could give any idea as to the annual amount of precipitation and the relative amount of water produced or deposited by snow fall. Yes, sir, I attribute the falling off in crop production per acre to the fact that the thinner lands—the uplands—have been brought under cultivation of late years. The acreage, you know, under cultivation increases every year, and that brings into cultivation these poorer lands. Yes, sir, and I think the result would be and is the same in other counties and upon other rivers. Not only in the State of Kansas but elsewhere, yes, sir. The thinner lands do not produce equally with the bottom lands. As to what I attribute this
8377 general increase in the rainfall of which I have spoken, I would say that we farmers have attributed *to* it to the cultivation of the lands, the plowing and cultivation of the lands. Scien-

tific men may have their own views about it but we attribute it to the breaking up of the soil and the cultivation of the lands. When I speak of an increased rainfall I am not speaking of any statistics, no, sir, but am simply giving my judgment as a practical farmer, from my memory.

Cross-examination.

By Mr. CAMPBELL:

Yes, sir, there were islands in the river when I came here. As to whether they are increased, well, where one would be swept out another would form. I doubt if there has been any increase in the islands in the *Kansas* river since I came here. No, sir, the islands have not increased since I came here in any way. No, sir, we do not begin to have the wind we had forty or fifty years ago.
8378 I don't know what has produced this change. As to whether we have had more destructive floods than we used to have, I will say in 1858 and 1859 we had very destructive floods, but didn't have much land under cultivation then. The destruction by floods has been greater. Yes, sir, the floods during the last three or four years have been more destructive than in the early days. I think it is true that by the cultivation of the soil and by erosion there is more silt in the river and the bed is higher than it used to be. The channel of the Kaw river is much the same as when I came here. There has been very little change in the Kaw river in fifty years. The bed may be a little higher and the banks a little higher, but it is about the same all the years that I have lived here.
8379 No, sir, these rivers have not been narrowed for the purpose of building bridges, in no place I know of excepting at Topeka, and they forced them to take them out and they are now lengthening the bridges again.

8380 HILL P. WILSON, Topeka, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I am assistant secretary of state of the State of Kansas, and have held that position about seven years. I have been senator for the 40th district in this State, and receiver of the United States land office for three years, located at Wakeeney. The 40th senatorial district comprises the counties in the northwestern portion of the State. There were thirteen or fourteen counties in it when
8381 I was elected, and we usually made a tour of those counties when I was a candidate for senator. My home is in Hayes City, Ellis county. I went there in 1867, and my residence is there still. I temporarily left Hayes City in 1897 to come to Topeka. While I was at Hayes City I was engaged in merchandising and farming and in the banking business, and I am familiar with the

farming conditions and the raising of crops while I lived
8382 there. While there I was post trader at Fort Hayes for about ten years. I first came to Kansas in 1867, and went first to Fort Harker. I arrived there in August and went to the end of the track—they were building the Union Pacific railway—as an agent for the quartermaster department, shipping supplies from the end of the track to western posts. Fort Harker is in Ellsworth county, the present site of Kanopolis.

The Smoky Hill river flows through the southern part of Ellis county, and the Saline through the northern part, from west to east. Big creek, a small stream, is a branch of the Smoky Hill, close to Hayes City, and Fort Hayes was located on Big creek for years. I was post trader there as long as it was a military post of any importance. As to my acquaintance with the Smoky Hill and Saline rivers while living in Ellis county, in the early days we were very much interested in those bottoms because we wanted to cut
8383 hay on them for the contracts for the military post. There were more or less cavalry maintained there. There was generally a regiment during the summer and two companies of cavalry during the winter, and the contracts ran from twelve to fifteen hundred tons of hay, and we depended on the bottoms of the—that is, we tried to depend upon them—the Smoky Hill and its tributaries and the Saline, for hay, and in that way we became familiar with them in the early days. Latterly, after the country was settled up we retained our familiarity with them in an ordinary business way.

As to how the Smoky Hill and the Saline compare at the present time with the same streams in the early days, I will say, well, there is not much difference as to the extent of the water flowing in them. I would not be able to say positively, because my recollection is that simply in crossing the streams at different seasons of the year and different years sometimes they were high and sometimes they were low. But generally speaking there is not much difference, if any. I think at the present time there is perhaps more water
8384 flowing in those rivers than usual because there has been more rain in the last two or three years. But generally speaking there is not a very appreciable difference. As to the channels or beds of the streams, and the banks, well, they have not changed at all. The banks along these streams are low. The Smoky Hill—well, I would call them low in comparison with Big creek. They are about sixteen feet, and the banks of Big creek about twenty feet. Big creek is a very narrow stream and the banks are deep—probably twenty or twenty-five feet.

As to the fertility of the soil along the bottom lands of the Smoky Hill and Saline rivers in Ellis county, and as to whether the bottom lands are as fertile or not, I will say, oh, yes, they are fertile except where there is too much sand. There are bars of sand. But the bottom land that is sandy is not very much. As to the fertility of the soil on the bottom lands of these two streams as compared
8385 with the fertility of the soil on the uplands, well, the bottom

lands produce better corn, and the uplands, I think, produce better wheat. As to which was first settled in Ellis county, I would say the bottom lands were first taken. Not exclusively either. The first settlements were—yes, the bottom lands were taken first. They were taken up by the cattlemen first who came in there. The farmers began to settle around Hayes City, being interested in the markets and railroads, but they selected bottom lands wherever they could get them, first. The bottom lands were first settled in the other counties in that vicinity. As to how I account for that, well, there is more convenience with regard to water. The water is more easily obtained and there is more timber which is desirable and the bottom lands were more fertile. They raised better crops. Then they have the wash from the high lands and
8386 the soil is deeper and richer, except where it is all sand or where the river has overflowed them and destroyed the valley some. During my residence in Ellis county I have been familiar with other streams only in a general way. I have crossed the Solomon a number of times, and have crossed the Arkansas river. As to the flowing water in the other streams in that part of the State, as to whether it has increased or decreased in later years (objection), I will say, on the north, I have crossed the Solomon river a number of times, and I have been on the Republican, and I don't know that there is any difference. Then I have been along the Arkansas river by rail and have heard a good deal that things were pretty dry down there, but I wouldn't be able to state anything positively in the matter from my personal knowledge.
8387 I was interested somewhat in the Arkansas river. (Motion.) I was interested in the Arkansas river in the early days before the Santa Fe road was built, on account of freighting to Camp Supply, and the crossing of the Arkansas river at Fort Dodge was always a problem on account of the water in the river. That was from 1868 to 1870 and a part of 1871. As to what the problem was, well, the river had to be crossed, and there was always more or less delay there of trains, and it was a question of loading trains and all that and the Arkansas river had to be figured on. The trains I refer to were ox teams, supply trains. Yes, sir, we were hauling supplies from Fort Hayes to Camp Supply, about ninety-five miles south of Fort Dodge, in the Indian Territory. As to why it
8388 was found difficult to cross the Arkansas river at Fort Dodge in those days, it was simply on account of crossing the water in the river. It was kind of miry. As to what time we crossed the Arkansas river, well, that was all the year round—all the while.

As to the width of the bottom lands of the Smoky Hill river through Ellis county and in that vicinity, I will say, the bottom lands are practically insignificant; that is, what we call the bottom lands—the land first above the river bed. There are small bends and some places of course where the bluffs come down to the river. As to the average width of the Smoky Hill bottom lands through Ellis county, I would think half a mile would

cover the bottom lands, and as we go west they narrow, and as you go east they widen some. As to the Saline river, that is about the same, not much different. The bottom lands of the Saline narrow as you go west and widen as you go east, and they would probably be about the same through Ellis and Russell counties. They
8389 get wider in Lincoln, and in Saline county they widen out out very much. Yes, sir, the Smoky Hll and the Saline are the principal rivers in the neighborhood of Ellis county. The Solomon river gets within about twenty-five miles of Ellis county. It is in Rooks county. As to the width of the bottom lands of the Solomon river through Rooks county, well, I haven't sufficient information to give an opinion on that. I have been on the Solomon river, I suppose, east from Stockton and immediately north of the river, but I was not paying much attention to the valleys. I could give my general impression. The valleys narrow as you go west; they widen as you go east, from perhaps a mile in the eastern part of Rooks county, through Osborne county, to two and a half miles when you get to Saline county. The cultivation of the bottom lands in Ellis county was first began about 1873 and 1875—along there.
I suppose I am the pioneer cultivator. I believe I had the
8390 credit of sowing the first wheat in that part of the country. That was in 1872. That was probably the first west of Ellsworth county. As to what caused the soil to begin to be cultivated there rather than in Ellsworth county, it was on account of the military post. The military post created the settlement. My homestead lies on Big creek, in Ellis county, and Hayes City is built on that homestead now. I owned that quarter section of land until 1895, I believe. Yes, sir, I have continued the cultivation of that farm during the time I owned it, and I was interested in agriculture in other places to the extent of growing from 600 to 800 acres of wheat on lands in Ellis county. As to whether I was in the
8391 habit of engaging in agriculture, that is, in farming lands during all the time that I lived there, I will say, oh, no, from 1872 when I planted the first crop of wheat, that was the beginning of the wheat growing industry in that part of the State, and it gradually increased year after year until the present time. That planting was simply an experiment to know whether the stuff would grow or not. There were only five or six acres of it. Then the next year some others did the same work. There was some wheat grown in Ellis the next year, and also near Hayes City. The farming in Ellis county practically began in 1875 with the incoming of some settlers and Russian colonists that came in. It was considered doubtful at first as to whether crops could be grown in that county, but the years have demonstrated to the contrary. I began
8392 my operations there in 1872 and continued them until 1896 and gradually increased my operations from four or five acres the first year to seven or eight hundred acres the last years. The crops have been better since 1896 than they were for four years before that time. Farming conditions have been

very favorable and the farmers have been very prosperous since 1893. As to whether the fertility of the soil in the valleys of the Smoky Hill and Saline and their tributaries in Ellis county is as great now as it was when the cultivation of the soil first began, I will say, yes, sir, so far as I know that is my opinion, and I know from crops that are being raised there by different people that the soil produces just as well now as it did then. There don't seem to be any difference. As to whether just as large a crop of corn
8393 or wheat can be raised upon the bottom lands of these rivers as when they were first cultivated, I will say yes, sir, just as good. If the statistics should show that there has been a great deal of falling off in the yield of wheat and corn in the State, as to what I attribute it to, I would attribute it to the cultivation of the poorer lands. I wouldn't know what else to attribute it to. To explain that, I would say the first settler takes the best land, of course, and the last settler takes what is left, and the result would be that the best land would be cultivated first. I would not know what else to attribute the difference to, because the lands produce the same as they did before—the bottom lands produce the same as they did before and the uplands produce the same. I don't know as there was much of a falling off of crops. As to whether the cultivation of the poorer lands has been gradual, I will say the people are cultivating lands
8394 now that they never dreamt of cultivating in the earlier years. They are cultivating some pretty thin ground now. No, the cultivation of the uplands and the poorer lands came on gradually. They cultivated, of course, the best lands first, and included the uplands when they could get no more good lands. Certainly that would show an increased acreage. The growth of crops upon the first land settled in my neighborhood—the yield was larger, of course, because they were solely the choice lands that were cultivated. I am very clear upon that point. And then the secondary lands would be taken up and gradually the thin lands on the bluffs and the draws would be taken up and the people tried to cultivate them. These added to the area under cultivation and reduced the output per acre.

Cross-examination.

By Mr. HAYT:

8395 The people in our part of the country think that the first crop after the breaking up of the land is generally better than the average crops grown afterwards, but there is no complaint in my part of the country of the land wearing out. They seem to raise about the same average crops now that they did twenty years ago. The first year after the breaking it produces a better crop, yes, sir. They break the ground one year and sometimes raise a crop of sod corn on it, and break that up in the fall, and the next year they get perhaps a better crop than they will ever get again, unless climatic causes intervene. I am speaking now of averages. That first

crop after the breaking has been done is usually the best crop, but after that the land yields an average crop one year with an-
8396 other. I came to Ellis county in 1867 and established myself at Fort Hayes in that year. No, the hay used at the fort at that time was not all grown upon the bottom lands. We sometimes shipped that hay from the east and didn't know where it was grown. Some seasons when the rain was more favorable we could cut some hay on the uplands, but generally we could cut hay on the bottom lands. Yes, sir, the general supply for the fort came from the bottom lands. That continued during the time the post was occupied. It wasn't occupied as a cavalry post after 1876. The first railroad through that part of the country was the Kansas Pacific, in 1867, and shortly after the fort was established we were put in communication with the eastern portion of the State by that railroad, yes, sir, and some years after that they shipped all of the hay in. We
8397 bid for hay on the basis of shipping it in, and then if we got the hay at home we made some money and if we had to ship it in we would break about even. The Government, of course, depended upon the contracts for its supply of hay, and this supply from the contract some years came from cutting it there on the ground and some years from shipping it in. It was about half and half. It would depend to a large extent on the hay crop, whether it was a good or poor crop, as to how much there was, yes, sir. The crop varied largely during those earlier years. One year we
8398 hauled hay from Blood creek down on the Arkansas. That was because there was no hay on the Smoky Hill. We would not have hauled it thirty-five miles if there had been anything nearer.

I can only give you a guess as to the fall of the river in the vicinity of Fort Hayes. I think it was four or five feet to the mile. That is only an opinion. I have nothing to base it on only the general knowledge that a man has. People say that is about the fall of it.

As to whether I charged my mind with reference to the productiveness of the soil in that locality particularly in the earlier years, I would say a person's mind is naturally charged with what he produces when he puts his money into raising a crop. In
8399 those early years when I was at the fort I did particularly charge my mind with the crops being produced in the country. Yes, sir, while I was post trader at the fort I had taken a homestead between the town and the fort, and lived on my homestead, and after the settlement came in I became interested in dealing in lands, and of course I was interested in the value of lands, and that naturally reverted to the crops that were being raised on them. From 1868 to 1876 I was post trader at the fort. I think that was the most profitable part of my business, yes, sir. I gave that my chief attention. Yes, sir, since I have been connected with the State government I have visited Ellis county frequently, and I vote there and am there every year and I have had lands there and have taken

care of them. I have been there oftener than once a year.
8400 I have been there twice in the last thirty days. On an average in the last seven years since I have been employed here I have visited Ellis county I suppose a dozen times a year, guessing at it. As to whether those visits have been of long or short duration, I would say I was there when they were threshing. I was always there then, and that took several days, so that during each harvest year, when we had a crop, I was there seven or eight days, and I have generally gone there to see how the plowing was being done and to look after my interests generally. I would make a couple of trips there during the season.

No, sir, I did not cross the Arkansas river in 1867 and don't know how the water in the river was that year. I was only on the bank of it in 1868. As to when I had this difficulty in crossing it, I will say, well, there was always more or less talk about it, you know.
8401 As to when I had any trouble in crossing the Arkansas river, I would say, the freighters had trouble crossing it with their wagons, but I had no trouble. I didn't cross the river. I didn't have occasion to. As to how I got my information that the freighters had trouble in crossing the river, I would say we were posted on that all the time. That was stock in trade. I was at Fort Hayes at that time. Perhaps I visited the river at Dodge City in the years 1868, 1869 and 1870 about three times. Yes, sir, I saw the river about three times in the three years in the vicinity of Dodge City. Yes, sir, I saw it in 1868, but not in 1867. I don't remember what month, but it was either in October or November. As to how the water
8402 was, I will say I just saw the river but wasn't there to look at the river or inspect it. Yes, sir, I know there was water in it there, but as to the amount of water I could give you no idea. I don't believe I could specify any particular amount, but there seemed to be probably fifty feet of water, something like that, in width, yes, sir. I don't know how deep. As to how near I was to the river, I was looking at it from just below Fort Dodge. I was just at Fort Dodge and seeing the river. Walking down that way you could see it. Fort Dodge was probably a quarter of a mile from the river, or along there, I guess. I was not there more than one day that fall. As to what was the business that called me there, I would say it was just going over. The troops were moving in the
8403 country at the time. No, sir, I never saw any troops go across the river dry shod. I don't think I saw the river in 1869. I was thinking what took me there the second time. It was some business I had with a man named Henderson, a freighter, and I went over to straighten up that business with Mr. Robert Wright, who was the post trader at Fort Dodge. I think that was in the spring of 1870. No, sir, I don't think I was there in 1869. I think it was in April, 1870, I was there, but I will not be sure about that. I was not there again in 1870 after April. I think I was there two days in April, 1870. As to the condition of the river at that time, I don't remember anything about the river. No, not at that time.

I didn't charge my mind with the condition of the river. I
8404 have never charged my mind with it in any manner, except as I say, the general proposition of crossing the Arkansas river as a freighting proposition, and I got that information from the freighters and others, yes, sir. I don't remember that they ever reported to me that the river was dry at Dodge City, no, sir. I don't remember that I ever heard of it being dry at Dodge City or in that vicinity until this general talk has been going on that the river was drying up. No, sir, I never heard in the earlier times that the river had dried up and that the buffaloes had left the country during any year. It would naturally be at a time when the freighters had difficulty in crossing the river that I would hear from it. They reported if they had difficulty in crossing the river. If they had no difficulty in crossing the river I think they would say nothing about it in all probability.

8405 The crops on the Saline and Smoky Hill rivers were generally very poor in 1893 and 1894, but they were a little better in 1895, a little better in 1896, and fairly good since then, or from good to fairly good ever since then. Yes, sir, that applies to the crops in Ellis county. Last year the climatic conditions affected the crops so that they were not so good there. Yes, sir, we had some dry years up there during the earlier years I was located in Ellis county. Plenty of them. And the result upon the crops was that there was a failure.

8406 If it has been stated by Chancellor Snow, at one time chancellor of the State university of this State, that experience has shown that there is a periodicity of dry and wet years, the wet years covering a period of about seven years and the dry years covering a like period of about seven years, as to whether that conforms to my experience in the country or not (objection), I will say I think the seven years covers too long a period. That is my experience. In
8407 the earlier years they rarely had more than two fairly good crops in succession, and then two or three years of trouble or failure. As an illustration: We had two or three years of good crops up to 1892. In the year 1892 it was exceptionally good. Then the year 1893 was a total failure so far as that section of the country was concerned. In 1894 it was a failure, but something better; 1895 was better, and 1896 better; so you may say, then, it was 1893, 1894, 1895 and 1896—there were four years. That would be a period of unfavorable crop conditions. Since that time we have had a period equal to Professor Snow's statement, of good crops. Before 1892 or before 1888 the dry periods exceeded the wet ones. Unfavorable periods were longer and favorable periods shorter.

I have stated it definitely since say 1890, and before that my memory don't serve me so that I could state accurately the favorable seasons and the unfavorable ones. Yes, sir, I said that I
8408 thought seven years was too long a period, prior, you might say, to 1896. I would think perhaps three years—from two to three years—prior to 1896 would be a proper length of the period.

I was going to say in explanation — this, that conditions, of course, in that part of the State do not apply to Professor Snow's figures for the whole State. For insta-ce in 1893 if there was a square rod of wheat cut in Ellis county I never heard of it. I had eighteen hundred acres of wheat in that year. Now that is not true of the State by any means. So I am not setting myself up in opposition to Professor Snow, but simply giving my own experience in my own home. As to the whole State, I have no information about it.

Redirect examination.

By Mr. ASHBAUGH:

8409 There may be exceptions to some of those periods, even though we reduce it to the short period of three years. I have never heard of any absolute rule about the matter. I wish there was. The effect of the water or of the rainfall on our crops depends more upon the distribution of the rainfall .than upon the quantity of it. While the quantity of rainfall may be normal, if it is not properly distributed through the year it makes a great difference with the growth of the crops, and some of those general statements may be entirely untrue as applied to particular localities and particular times, certainly.

8410 As to my speaking about the second crop after breaking the sod being the best, I suppose there is some fertilization in the breaking of the sod, what may be accumulated in buffalo grass turned under, that may stimulate the growth of the first crop. The theory with the farmers in my neighborhood is, and it is my own theory, that when the sod is broken the breaking and turning over of the sod in the first place stops the gowth of vegetation, and the sod as turned over also prevents the radiation of moisture from the soil. The whole problem in the growth of crops in my section is one of moisture, and anything that will conserve the moisture will tend to promote the growth of the crop during the coming year, and in turning over the sod you stop the growth of grass and the radiation of moisture and heat from that, and that operates as a mulch or shale and holds the moisture in the ground so that there is a greater reservoir of moisture in the ground to sustain the crop and produce a crop the next year than you will find in the ground when the ground is in cultivation. After the sod has been entirely rotted it no longer is a mulch; it is soil then. (Objection.)

Cross-examination.

By Mr. CAMPBELL:

8411 My place is in Ellis county, half way between the Saline and Smoky Hill rivers, but it is on the bank of Big creek, right on the stream. Yes, sir, I have sunk wells there. I have to go twenty-eight feet for water. I sank wells in 1873, I think. They were 150 feet from the stream. I have not personally sunk

wells there recently; others did, all over the country. They have to go the same number of feet now for water in the same neighborhood. No, the water level around there has not decreased any, nor lowered, in any respect. We get our water easier on the bottom lands than on the uplands.

8413 JOHN S. DAWSON, Topeka, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in the State of Kansas, and have lived in Kansas eighteen years, in the northwestern part. As to how familiar I am with the lands in a number of counties in the central northwest part of the State, I will say, well, in Graham county and Trego and Norton and part of Decatur counties I am pretty familiar with it, and in some of the other counties, but not so much so. As to how familiar I am with the valleys of the Solomon and Saline and Smoky Hill rivers, I have been on the Smoky Hill in Trego and Ellis counties, and probably somewhat into Gove county a number of times, and particularly on the north Saline, that is, a tributary of the main Saline, I am quite familiar with it, and the two Solomons, and the Prairie Dog, for fifteen or sixteen or eighteen years. As to how wide
8414 on an average the valley of each of these streams is through the counties in which I am familiar with them, I will say, on the Prairie Dog in Decatur county the valley is narrow—from forty rods to half a mile; the north Solomon, around Mason, New Almelo and away down the stream past Lenora and Logan and Kerwin there, is from a quarter of a mile to a mile, and the Bow creek valley which lies between the north Solomon and the south Solomon is usually pretty narrow—a quarter of a mile, or sometimes it may be half a mile wide, and the South Solomon in Sheridan county and in Graham county is usually from a quarter of a mile wide to half a mile wide. There are places where it is wider. In Rooks county as far east as Stockton it is considerably the same, although down at Webster it stretches out until it is about two miles wide. East of Stockton, while I have been down the river, yet I do not recollect particularly how it is down there. The north Saline valley is very narrow. There are places on it where it is probably half a mile wide. The main Saline river is in the southern part of Graham county, right south of Hill City and southwest of Hill City, and that is about the only place I know it well. It is about half a mile wide in places, and in places it is narrower. The Big Creek valley is quite narrow. That is south and southwest of Wakeeney. That is the only place I know it well. The Hackberry valley, which is a tributary of the Smoky, is quite narrow too. It is about like the other val-
8415 leys. Then the Smoky, in the western part of Ellis county and southern Trego county, is usually quite narrow. But there is one thing I would like to say about all these valleys.

There are a great many places out in these counties I have mentioned where the boundaries of the valley are not well defined. Nearly all these streams flow east, and on the south side of the stream the limitations of the valley are well defined. There are usually bluffs somewhat steep. And then on the north side the approach from the high prairie down to the valley is very gentle—very gradual. In many places it can hardly be defined. For the greater part of the time while I was in that part of the State my home was in Hill City.

As to the flow of these rivers, and especially the Smoky Hill, Solomon and Saline, for the last number of years as compared with the flow during the earlier years, I will answer, I think there is
8416 no material variation. There is no material variation in the width of these rivers as to their banks. No, sir, the channels of these rivers have not been filled up with islands.

As to what lands through all of that country were taken up, entered, settled and cultivated first, I will answer, the valley lands. As to which is more productive, the valley lands or uplands, I will say the valley lands. After the valley lands were taken up then the best of the uplands were taken up and cultivated, and after those the rougher lands, and after those then they moved on out west. As to the productiveness of those bottom lands as to having changed in all the years I have known them, I will say there is no material falling off in the crops in that part of the State. If the records introduced in this case taken from the agricultural reports of the State of Kansas should show that in a number of those counties the general average
8417 of the corn, wheat and oats crops per acre are less today than in the early years, and that that same condition is true of a number of other counties adjoining those, as to what I attribute that decrease in the average yield per acre, I will answer, in the early days there was no farming done, and it was almost exclusively in small patches of bottom lands, and in later years the uplands are farmed quite extensively. As to the kind of crops that we raised on the uplands in the earlier years, well, the upland crops in the earlier years were so trivial that no one paid any attention to it. As to what kind of crops they got on the bottom lands in those earlier years, well, except in very dry seasons the crops were good, and as to the average yield per acre of the
8418 bottom lands in those early years, I will say it made a good showing. As to the kind of crops raised on the uplands as compared with the crops raised on the bottom lands, well, as I say, in the early years the upland crops were of no consequence either in area or the number of bushels per acre. If after the uplands were added to the acreage of the county and the kind of crops that I have just described, as to what effect that would have upon the subsequent average yield per acre, I will answer, it would reduce the general average.

Cross-examination.

By Mr. HAYT:

I am an attorney at law, employed at the present time in the attorney general's office in the State of Kansas, and have been here a little over two years. Yes, sir, we inherited this case under
8419 consideration from a former administration, but as to what interest I take in this controversy, I would say none whatever, no, sir. As to whether I care how it is decided, certainly I want to see Kansas win. I have got that much State pride in the matter, but that is about all. But from this State pride or for any other reason it is not sufficient so that it will cause me to lay awake any portion of the night. I suppose I must admit I would like to see this State win, if that is material.

I was admitted to the bar on March 1st, 1898, in Wakeeney. As to whether I have given my attention more particularly to the practice of law since that time, I would say no, only for the last three or four years. The first three or years I didn't give much
8420 attention to it, in fact I gave more attention to the law, possibly, before I was admitted, for the first two or three years than afterwards. Yes, sir, the first two or three years before I was admitted I gave a great deal of attention to the study of the law particularly. As to how much experience I have had in farming in Kansas, I will say from 1887 to 1894 I think I farmed some every year. I usually farmed in the summer time and taught a country school in the winter time and it is true I took a hand in driving cattle and that sort of thing in the earlier years. No, sir, I have done no farming since 1894. In 1887 I was quite a lad, yes, sir, but my farming was quite extensive from 1887 to 1894. I put out a hundred acres of corn when I was nineteen years old, and my time was devoted in those years between farming and the cattle business and country school teaching,
8421 yes sir, in that homestead country as it was mostly at that time. Yes, sir, I spoke of the flow of the water in these various streams for the last two years as compared with the earlier years, and I included in that list the Republican. No, I don't know whether any official measurement has been made of the flow of the water in the Republican river and official records kept by the Federal Government with reference to such flow for the last ten years. I suppose there has been, but I don't know. I know in a general way that the Government is interested in that thing and is making some surveys and measurements. No, sir, I have never investigated the flow of these streams carefully by making any measurements or anything of that kind. If the reports of the measurements made under the supervision of the Federal Government should be at variance with the conclusions that I have stated, as to whether I would think that the reports of those who measured the streams
8422 would be correct, I would say (objection), now, if the Government reports will show that there is a variation in the flow o

the Sappa, the Prairie Dog, the North Solomon, Bow creek, or the South Solomon, the South Saline, Big creek, or the Smoky, out in that part of the State, I would be very much surprised. If it did show that, however, I would say I must be mistaken. As to why I excluded the Republican in this answer, I will say, that is almost the limit of my ramblings. It is true I have been on the Republican two or three or four times, and on the Frenchman, away up in your country, yet I am not familiar with those streams, nor the Beaver, nor the Driftwood, nor those streams up there, enough to even risk an opinion. Yes, sir, all those streams are streams of fluctuating flow and a very decided change in the amount of water carried from time to time. At different seasons of the year there is more water in them than there is at others. As to what I can say concerning the sudden rises and falling off of the flow in these streams, well, the South Solomon, where I live, rises very swiftly sometimes, but my general im-
8423 pression of the matter is that those streams do not usually rise as swiftly as they did in the earlier years. Yes, sir, I think it is true that as compared with eastern streams the rises are very sudden and very violent and the fluctuations very much greater, although, as they are, it is not so much now. In the early years when we had so much buffalo grass it just turned the water like a shingle. It rushed into the draws and came down very swiftly. Now the cultivation of course absorbs a considerable portion of the water, and prevents this rapid run-off of which I have spoken, yes, sir. As to whether with the streams fluctuating as these streams do fluctuate it is very difficult for a person to speak definitely of them as to the average flow during any period of years, I will say, well, I suppose it is somewhat difficult, and yet to one who has known those streams for years he has a pretty fair guess as to whether or not there has been any material variation. As to over what period of years my investigations extend, I will say I am dealing with the years as a whole. I have known most of
8424 those streams for fifteen years and some of them for eighteen years. Yes, during that time the area of cultivation has been largely increased—very greatly. I couldn't give you more than a rough estimate of the percentage of increase, but I would say that the acreage of farm land has increased several hundred per cent. I know when I went to western Kansas first, from Lenora to Wakeeney, there was not half a dozen frame houses. That is a country of fifty miles in a stretch. Now it is entirely changed so that there are substantial farms, farming lands, fences and all that sort of thing where we used to cut right square across the prairie and see neither house nor broken ground except just nestling down in the valleys. There was a drouth in this part of the State here during the last fifteen years, I thought a pretty severe drouth, here three or four years ago. That is the only one I have in mind, yes, sir. As to whether there have been dry years and wet years, well, of course

I haven't been down in the eastern part of the State long
8425 enough to say much about it. Yes, sir, in speaking of this territory with which I am familiar during the last fifteen years I would say we have had dry years. In 1887 that was a very dry year in Smith county and in Phillips county, but, strange to say, it was not so dry in Graham. I settled in Smith county when I first came to Kansas. That was in the spring of 1887, and in the winter of that year I located in Graham and I found the farmers there had good corn. Speaking generally, we have had a number of dry years, yes, sir. In 1888 we had a pretty fair crop. In 1889 a pretty fair crop. In 1890 there was almost a total failure. And so on that way. Yes, sir, the production depended almost entirely on the rainfall. As to the effect upon these streams when we had dry years, I will say some of them it didn't seem to affect. There are a number of these streams that are fed by springs, but I have seen the South Solomon dry for half a mile, but I can't say that I have seen any of the other streams dry. Yes, sir, I remember when they were
8426 very low. I have seen them pretty low. Yes, sir, the flow of the water was affected almost entirely by the rainfall—the rainfall and snow and springs. We have a number of springs there that feed some of the best streams we have.

Redirect examination.

By Mr. ASHBAUGH:

Yes, sir, I own a little land in the State of Kansas. Not very much at the present time. Sometimes I have had more and sometimes less. I have owned four or five or six different tracts in Graham, Trego and Shawnee counties.

8427 F. D. COBURN, Topeka, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Topeka, Kansas, and have lived in Kansas a little over thirty-eight years. I am secretary of the State board of agriculture, and have been its secretary nearly twelve years in this instance and I was secretary twenty odd years before for a time. Taking it all together, I have been connected with the State board of agriculture of the State of Kansas for fifteen years. All of the volumes of the biennial reports of the State board of agriculture have been published under my direction during that time.

In gathering the statistics showing the average yield of crops in the different counties, and especially corn, wheat and oats,
8428 as to whether I made any distinction between bottom lands and uplands, I will answer, no, sir. Under our system of gathering these statistics there is no provision for anything approaching that. If these statistics show the average yield for the

whole country, as to whether that would indicate how much of that country is either bottom land or upland, I will answer, not in the slightest degree, no sir. I am familiar with the 14th Biennial Report for the years 1903–4. I made it. And I am familiar with the statistics set out on pages 949, 950 and 951. These statistics were compiled under my direction. As to whether they are reasonably accurate as we could make them, I think they constitute the court of last resort in such matters. The column on each of these pages showing the average yield per acre—on page 949 of wheat, on page 950 of corn and on page 951 of oats—seems to indicate a de-
8429 crease in the average yield per acre, yes, sir. As to how I explain that decrease in the average yield per acre as shown on these three pages, I will answer, I know of but one explanation and that would be that in the earlier settlement of the State when the immigrants took the choice of all this land they naturally took the land adjacent to the streams, presumably the most fertile and productive, and the earlier statistics are made up from the yields of these more productive lands, and as the State has advanced in years these outlying lands on the hills and slopes have been occupied, presumably the thinner or less desirable lands, and the more of those less productive lands that have been put into cultivation the smaller the general average of a given county would be likely to be.
8430 As to whether these statistics of the average yield show that the average yield has decreased and show that there has been a decrease in the productiveness of the bottom lands along any particular river, I will say, not in any wise, no, sir. In making this answer I wish to make it clear there that the statistics as employed in a preceding answer of mine here do not bear upon the productiveness of any particular lands adjacent to the streams as differentiated from any other lands. The productions of these lands are grouped by counties and not by rivers or localities of that character

Complainant offers so much of pages 949, 950 and 951 of the 14th Biennial Report of the State Board of Agriculture of Kansas, vol. XIX, for the years 1903–4, as shows the average yield per acre of wheat, corn and oats respectively, of the State of Kansas, being the column of years and the columns showing the average yield per acre as follows :

(Objection.)

8431

Years.	Wheat. Av. yield per acre, bushels.	Corn. Av. yield per acre, bushels.	Oats. Av. yield per acre, bushels.
1860	.....	.....	.....
1861	.....	.....	.....
1862	21.00	40.00	33.00
1863	16.00	44.00	30.00
1864	15.00	25.00	29.00
1865	15.00	41.00	34.00
1866	21.40	34.20	39.00
1867	14.00	38.60	36.00
1868	15.60	18.00	25.00
1869	18.50	48.40	42.10
1870	15.00	33.00	31.50
1871	15.90	40.00	31.80
1872	11.60	38.50	32.50
1873	14.00	39.10	33.00
1874	13.79	10.25	24.25
1875	17.77	48.80	33.88
1876	14.28	43.68	31.61
1877	13.45	40.38	41.16
1878	18.67	37.13	39.19
1879	10.63	36.29	23.22
1880	10.34	28.53	24.03
1881	9.38	19.33	29.28
1882	22.29	35.36	41.46
8432 1883	19.25	39.14	44.61
1884	21.47	41.99	37.25
1885	8.34	33.67	34.86
1886	8.29	24.05	30.37
1887	6.75	11.60	29.62
1888	14.93	24.13	32.99
1889	22.15	40.15	28.42
1890	12.40	8.84	23.77
1891	15.68	26.75	30.72
1892	18.05	27.74	28.04
1893	4.85	19.20	16.03
1894	5.82	10.45	12.88
1895	3.84	24.00	19.71
1896	8.27	28.03	13.06
1897	14.81	18.34	23.82
1898	13.14	17.54	20.57
1899	8.76	27.48	27.57
1900	17.66	18.25	29.45
1901	16.99	6.33	17.80
1902	8.67	28.80	32.21
1903	15.76	25.95	22.86
1904	11.11	20.33	17.24

8434 As to whether I can make my last answer any more definite or certain or give any more information concerning the point than I disclosed in my answer, I will say, in view of its probable ambiguity I wish to withdraw that answer and say instead that our statistics would not and do not indicate whether there is an increase or decrease in any crop on the bottom lands as distinguished from others. The smallest sub-division for which we compile statistics of crop acreages and yields is a municipal township, which may be of large or small area, and the varying character of its lands or soils, the areas of each kind and the crops they produce of each kind are not computed otherwise than collectively. The
8435 same system is pursued with reference to every portion of the State, township, county and State as a whole. As a whole, as to which part of our State was first settled, I will say the eastern portion—the eastern counties. As to which portion of the State from an agricultural standpoint has the higher productiveness, I will say the eastern portion, especially as to corn and oats. This is possibly not so applicable to the wheat crop.

Cross-examination.

By Mr. HAYT:

As to what is the dividing line between the east and west in corn production, I will say, speaking in general terms corn is not a suitable crop west of 200 miles west of the Missouri river. The State is 400 miles long. The west half of the State I should have said.
8436 As to whether that is about Great Bend, I couldn't tell without looking at the map. Corn is not considered a suitable and reliable crop in that part of the State west of Great Bend. I do not wish to be understood, in saying that, to mean that they do not grow corn in counties farther west, but the corn crop of the State is grown east of Great Bend.

8437 THOMAS ANDERSON, Topeka, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live in Salina, Kansas, and have lived in the State of Kansas forty-four years and have lived the whole time in Saline county. I think I am quite familiar with Saline county, its rivers and its valleys, and to a limited extent I am familiar with the counties that border upon Saline, and am familiar with the Smoky, Saline and Solomon rivers that flow into and make up the Kansas river. I am familiar in a general way with those valleys and the small streams. My business during these years has been farming and stock raising. I have been State senator from 1880 to 1883, and I have been mayor of Salina.
8438 As to whether the flow of the Smoky Hill, the Solomon and the Saline rivers has decreased or increased in the later

years in comparison with the average flow in the earlier years, I will say I think in both the Saline and Smoky there has been an increase in the flow in the last fifteen or twenty years. This is not speaking of the overflows and floods we have had but of the general average. The general average is more. There have been times in the earlier settlement of the country when we have seen both the streams dry and no running water in them, but not in the later years. As to the general flow of the Solomon, exclusive of floods, I am not so well acquainted with the Solomon, but from general information (objection) it is all about the uniform of the other two streams. I have land about a mile and a half or two miles from North
8439 Salina. I own land in the western part of the county too. There is one quarter section with a creek adjoining the section. One is used for agricultural purposes and the other tract for pasture. By agricultural purposes I mean farming purposes, and under cultivation for crops. This is partly bottom land—mostly bottom. This is on one of the tributaries of the Saline.

As to how the productiveness of the bottom lands in Saline county for the last number of years compares with the productiveness of the same lands in earlier years (objection), I do not see any diminution in the yields of either wheat or corn. With the same climatic conditions and the same quality of farming land I think the bottom lands in Saline county are just as productive now and have
8440 been for the last ten years as they were in the earlier years. (Objection.) I think that is true. The bottom lands in Saline and the adjoining counties were settled first; then after the bottom lands were settled the second bottom lands were taken up; they were the next best land. And after these were all occupied, the best portions of the uplands. There is some very good upland and some that is very poor. And after those portions were taken up there was none left to take, and what was left was the poorest
8441 quality of the land, yes, sir. (Objection.) The pasture land that I spoke of is prairie land—upland. Part of it would be good, tillable land, but most of it is not. As to those uplands being as productive for corn, wheat or oats as the bottom lands, I would say, oh, no. I have four wells on the farm in the Saline valley, at a uniform depth of twenty-four feet. These wells were put down a good many years a ago. I don't know what they are now. Probably less these last few years because the overflow has raised it two years ago. As to whether the water level or the point at which you find water in those bottoms is lower in these later years, well, I don't believe I could answer that question because I haven't dug any wells or driven any. As to whether in recent years they have had to sink their wells deeper, I will say I don't know that—yes, I am still able to get water from my wells without having to dig them any deeper. I have heard no complaint in our valley as to that, no, sir.

Cross-examination.

By Mr. HAYT:

8442 Yes, sir, I said in the early settlement of the country the Saline and Smoky were dry during some parts of the year. During the fall of 1863 there was no water in the river except in pools. There was no water running in the river, either the Smoky or Saline. I wouldn't be able to tell you just what other years there were when it was dry. Yes, sir, these rivers frequently were very low—frequently dry. Not entirely dry, but low. And that condition extended, I think, up to 1868. I think that was the last time I can think of now when the river was at the lowest stage. It was as far back as 1868. We didn't raise any corn at all that year. There wasn't even fodder. We had very dry years after 1884—from 1884 to 1890—about six years there, in my recollection, we had a series of dry years and raised very little corn. Yes,
8443 sir, the run-off from the rains was very rapid in the early years. The ground acted as a roof, as it were. It was packed hard and the water ran off in a few hours after a storm. That is pretty much the case now except in the smaller fields. Of course the roughest ground that makes the water sheds is not under cultivation. As to what effect the cultivation has had upon the run off to these streams, well, I wouldn't be able to answer that question with any certainty. It wouldn't seem to have diminished the flow of the water in the larger streams. As to whether it has had the effect of increasing the absorptive powers of the soil and has had the effect of holding back the water in times of hard rains and letting it out more gradually during the season, I would say I have no doubt but what there is something in that, yes, sir. As to what I attribute the increased water in these streams to in late years over what it was in the earlier years, I will say I don't know what I would attribute it to unless it would be an increased ra n-
8444 fall. I think it doubtless does come from an increased rainfall. No, I have never made any observations nor charged my mind particularly with the flow of the water in these streams, nothing but observation in passing over them and living near them. I couldn't say that I particularly charged my mind with it at any time. It is only just casual observation. As to whether it is very difficult for me to tell with any degree of certainty as to whether the flow in these streams has increased or remained about the same as in the earlier years, or has decreased to some extent, I would say it is generally conceded that it has increased. I speak more positively of the Saline and Smoky. The Solomon I said I wouldn't be prepared to say. No, sir, it is not difficult for me to tell from my own observation of this increased flow. Not at all. Yes, sir, I think there is an increased flow of late years over the flow of the earlier years. Taking the whole year together, I think I can answer
8445 that question by saying yes. Yes, sir, we have had periods I suppose of several years when the rivers have been lower than

ordinary and periods extending over several years when the average has been higher. Yes, sir, that is true. No, sir, as far as the Solomon is concerned, I don't know anything positively about it. Of course it is a matter of conversation between men living in different portions of the territory about the condition of the crops on the rivers, etc., but I don't know anything about it from personal observation.

As to what crops in our county the uplands are cultivated to, I would say that of late years they are principally cultivated to wheat, and not very much corn. The different communities have
8446 different qualities of soil on the uplands. There is a variation in the quality and kind of soil. In some sections of the country there is very little corn except on the smaller streams where they have kaffir corn and sorghum. In the southeast portion of the county they raise a good deal of corn. In the northwest portion they raise less corn and more wheat and the smaller grains; that is, speaking of the uplands.

As to whether wheat usually grows better on new soil than old soil, I think perhaps the quality of the grain is probably better for a year or two, and as to whether the productiveness is better for a year or two, well, no, I wouldn't say that. I don't think it would be any greater on new soil than old soil. I think there are other conditions that enter into the yield. Yes, sir, it is my judgment that in our county upon soil that has been cultivated to wheat for three or four years it does as well as it did for the first year or two after the ground was broken. I have a piece of land on my farm this year that has been in wheat more or less for six years that I think would go forty bushels to the acre if the storm last night didn't injure it. As to whether as a general proposition it is
8447 a fact that the wheat crop is better upon new land for the first two or three years after it is sown to wheat than thereafter, I would answer, I wouldn't say yes to that question. I don't think it makes any difference. It depends a good deal on the cultivation it gets. As to whether the cultivation of late years
8448 as compared with the cultivation during the earlier years is better, I wouldn't say it is better. There are some people who farm better and some people do not farm as well. As to the country generally there seem to be sections where it is better farmed and others where it is not farmed so well. The general result is that good tillage pays. I wouldn't say that tillage, as a general proposition, is better of late years on an average than in the earlier years, no, sir. I think the cultivation in Saline county is not so good of late years as it was during the earlier years. I think the uniform thought is to get more ground into wheat and more ground into corn, but that it is not done so well.

As to whether there is any reason why I limited my answer to the questions propounded by counsel as to the productiveness of the bottom lands and said that in my judgment there was no diminution in the productiveness of corn and wheat, I will say no, ex-

cept these are the staple crops and I supposed that was the information sought. There was no other reason for limiting my answer to corn and wheat. Of course there is a good many that have gone into alfalfa. That has decreased, perhaps, the acreage in corn. Yes, sir, I said in answer to a question that the overflow two years ago had probably raised the water in the wells during the last two years. No, I don't know whether it has raised the water
8449 in the wells or not. They are drove wells. Some are operated by windmills and some by hand. There are a good many windmills pumping water from the ground in our county. Nearly all of the farmers have windmills. No, they don't use the water for irrigation at all in our county. There may be an exceptional case once in awhile where a small tract is irrigated. Those wells run all the way from twenty-four to forty feet in depth. There are no drove wells on the uplands. They are all on the bottom lands, yes, sir, and they are located in the valley. There are no draws; it is all level, the Smoky Hill Valley bottom.

Redirect examination.

By Mr. LOOMIS:

8450 My farm is about a mile from the Smoky Hill river and just about the same distance from the Solomon. As to the corn crops from 1884 to 1890, the corn crop was very slight. Up to 1880 it was about uniform with what it has been the last ten or fifteen years. From 1890 up to the present time we have had pretty fair crops. I attribute the failure of the corn crop from 1884 to 1890 to lack of rainfall. As to there being an entire failure of corn during those years, you might say there was an entire failure. There might be exceptional cases in the bends of the river where they would have better corn, but on the uplands and the river valleys it was very poor.

8451 A. M. CAMPBELL, Topeka, Kansas.

Rirect examination.

By Mr. LOOMIS:

I live in Salina, Kansas. I first came to Kansas in 1853. I didn't settle. I just came to look at the country and see what they were making such a racket about. I was living in Clay county, Missouri. I went back to Missouri after first coming to Kansas. I returned in 1856 and have been here ever since. I located first in the village of Lawrence and afterward in the Delaware Indian nation across the river from Lawrence. Yes, I was familiar with the Kaw river in those days. I ran a ferry boat for the Indians for two years there. That was at North Lawrence now. It was the Indian coun-
8452 try then. I left Lawrence to go to Salina in 1858. I walked. There were three of us. I then settled in Salina. I didn't

leave for fourteen years except to go to the river for a load of goods, and I have lived there continuously ever since. There were no settlers at Salina then. Fifty miles east of us were the nearest settlers, at Chapman creek. I located right on the banks of the Smoky Hill river. I first located on the Saline river and then moved up on the Smoky that same summer. I located at Salina, about two miles from the Saline river. The Saline river empties into the Smoky about four miles below Salina. The Solomon empties into the Smoky Hill about six miles below that. When I went to Salina and took a piece of land I broke thirty acres, right on the fork of Mulberry and Dry creeks, or what was known in those days as the Petit Saline. That would be about two miles from the Smoky Hill river to the nearest point. Our streams
8453 are very crooked and consequently some of the bends come pretty close. Others are a little ways from us.

As to what business I was engaged in in those early years that made me well acquainted with the Saline and Smoky Hill rivers (objection), I would occasionally go out hunting up the Indians to trade with them. Trading with the Indians was a good part of our business, and I would also go hunting with parties and stay out a month or two. We hunted in those days mostly buffaloes. Wolf skins was a profitable business. Of course buffalo hunting, we didn't have to go very far, but for wolves we would travel up into Colorado and up as far as the branches of the Republican and Beaver creeks and up in that way all over. In trading with the Indians we would go all along over that country. Yes, sir, I established a mercantile business at Salina in the latter part of the summer of 1858 and traded with the Indians for some years. I continued that
8454 until about the time the railroad reached our country, and that spoiled everything, in 1867. The settlers didn't go into Salina prior to the war. They were very few and far between. As to the effect of the war upon the settlement of that part of the country, at the end of the war we had Indian troubles and bushwhackers came down from Denver, Colorado, and other places, and consequently they sent a great many troops back and forth, in fact we had two regiments of Colorado men settle in our neighborhood. We have them yet. They are good men too. Yes, a great many of the settlers left Salina to go to the war. They cleaned them out, all except myself, I believe, and one or two others. There were hardly any men left. That was a blank settlement at
8455 that time. After the war they came like a cloud of locusts upon us and settled up the country very rapidly. The choice bends of the river were first settled you may be sure. They always are. They wouldn't call those choice locations of bottom land choice now-a-days, but it was the choice of the early settlers. They always take it where they can get a little timber. It is generally the poorest land you can get, it is so broken up with rivers and creeks. The bottoms were settled first because the hills were covered with short buffalo grass and a great many of them were not

covered with anything. They had better crops there. Yes, sir, the bottom lands were more fertile. They had this blue-stem and only the little high points in the bottoms had buffalo grass, and it was only a few years after the Indians were driven back and the prairie fires stopped that there was any buffalo grass in the bottom or even on the hills. Yes, sir, the bottom lands were settled before
8456 the hill lands were taken up. The hill lands were taken up after the railroad came in, and none before. It was the second year after the railroad came before there was any hill lands taken. I was very sorry to see them taking them and advised them not to take them but to go farther west and take bottom lands, because I thought they would never succeed on the hill lands, because it was dry. The bottom lands held the moisture better. The hills shed the run-off and it would run off as quick as it fell, and consequently our hills are very steep and rough. We haven't very many level hills in our country. No, sir, it was not my impression and the general impression in those days that the islands in that locality and west of Salina could be successfully cultivated. We thought they would be fit for nothing but pasture; that is, the early settlers did.

As to being acquainted with the flow of the water in the streams in my neighborhood, well, I was pretty active out of doors all the time. I ought to be. I refer to the Saline and Smoky Hill generally. That is where I have been living since 1858, and part of the time I was on the other streams, back and forth occasionally.
8457 I would camp on them. Yes, I have been acquainted with the flow of the water in those streams, and particularly the Smoky Hill and Saline, ever since I went to Salina. Ever since I have been right on the river and have noticed them.

As to how the mean annual flow of the water in those streams during the later years compares with the flow of the water in those streams in the early days, I will answer, well, my impression is—of course I haven't kept any Government measurement or anything of that kind or followed it up, but it has been considerable. It is noticeable. A great deal. In those days there was winter after winter and summer after summer that we could go down the Smoky Hill or the upper Solomon and travel for thirty or forty miles and not see a drop of water. In my own vicinity I could go from my place five miles east of me and not find a drop of water except in a pool where we would strike a high bank or a clay bank and the water would sink and would come in there in the little hole. But no running water. But I have known that several years. As Mr. Anderson remarked, 1863 was particularly dry. 1860 was dry, for eighteen months or more. As to how it has been in later years, I will answer, we don't see that kind of thing now. It always runs more or less, but in those days if you wanted to get water you would
8458 have to dig for it. Oh, yes, I think there is considerably more water flowing in those streams now than in the earlier years. The dry period of 1860 started in the winter of 1859. Yes,

sir, there was no rainfall that winter. The summer of 1859 was a nice summer for crops up in our country and we raised a good crop. This dry period was for about eighteen months, a majority of which was during the year 1860, yes, sir. As to how far they go for water on the Smoky Hill bottom lands in the summer, the first well I dug is in what is Salina now. Of course the Government hadn't surveyed that land and we didn't know just where we were, except we were west of the 6th principal meridian, but we thought it was a nice place for a town there, and we dug a well, in 1858. That was a flood year. We struck the water at sixteen feet and walled it up about eight feet. The rock was very scarce and it was hard to get across the river on account of the flood. We had to make a raft and raft everything over. But we afterwards had to dig and sink our wells a little deeper. We probably went five or six feet deeper to keep the water supply, and then after that we had a survey by that time and we dug a well in the center of a square. We first went eighteen feet there and then afterwards Mr. Cowes and I sank it ten feet more.

8459 After that we were not compelled to dig it deeper. That was the last I ever heard of lowering a well. Following that we had considerable dry weather, and it was so dry we had to dig there and we got to taking cattle up to the plains. We had a road there to Fort Riley. We had to sink that well so that they could get water for their ox teams. That was in 1860. We couldn't get any water in the river. There was none there to get. So that they had to draw water for their ox teams. The last time I remember the Smoky Hill going dry was in 1363. I can remember it very well, for I just came from the front with the Indian brigade. We had it moderately dry down there, but when I came up into that country I was astonished it was so dry and I found it that way and it

8460 makes me remember the year well. As to the width of the channel of the Smoky Hill and Saline from bank to bank, I couldn't say, because I never saw it measured, but I suppose it is above 150 to 200 feet.

The general height of the banks above the normal surface of the water would be probably twenty-five feet. At our place it is about thirty feet. As to the average width of the valley, taking it west of Salina I suppose it would be about six miles. I couldn't average it. We have a great amount of streams that come right in there. There are a number of streams all coming in there together, yes, sir. That is the Saline, the Little Saline, the Mulberry, Dry creek and the Smoky Hill. They are all in there, just a number of streams running through the valley, so it is quite a distance. Yes, sir, right there the distance across that I spoke of would be at Salina where all these streams converge.

8461 As to the average yield of corn per acre in the Saline valley in the vicinity of Salina in recent years as compared with earlier years, I couldn't answer that hardly. I think, though, that there was very little corn planted in the earlier years. The settlers

there had very small fields and when it was a very favorable season they raised very large crops. I myself raised as high as fifty bushels to the acre in the forks of these creeks, right in the pockets. It was an exceptionally good piece of land and a good place to raise corn. Yes, sir, I think you can raise as good corn in these bottoms now as in the earlier years. With the conditions the same of course they will. But you know wheat brings chince bugs and chince bugs kill corn and you must remember that that affected the corn so much that they quit raising corn and commenced raising wheat, because they got to wanting wheat anyway, and it forced the others into raising wheat.

As to the fertility of the soil about Salina now as compared with the earlier years, oh, that land is inexhaustible. There is no use in talking, you never can use that up. There is from eight to ten feet of soil there, straight down. No sub-soil. There is no use in talking about the fertility of that soil, because it is so fertile it would take generations and generations to use it up.

Cross-examination.

By Mr. HAYT:

8462 Yes, sir, I spoke of running a ferry boat on the Kaw river in the earlier days at Lawrence. As to the width of the flow of the water in the river at that time, that would depend on the season of the year. In the spring we had lots of it, so that steamboats went clear above us. As to when we looked for the high water in the spring, well, in 1857 it came in February, and we had about eighteen inches higher and it piled up about eighteen inches high right there and I had a good deal of trouble with my boat. As to what months I expected the water to be high, I would say, from March to the first of June. We called them June rises, and why we called them that I don't know, because we never go near the mountains with those streams. We always spoke of those as the June rises, yes, sir, and they are generally known throughout this country and denominated that, but there was no June rise about it. It came as early as February, in my experience. Yes, sir, although it

8463 came in February it was still designated the June rise. The boat I ran was a flat-boat, sixty feet long and about eighteen feet wide. It drew a good deal of water, so much so that in the summer when they were running steamboats, in the spring or summer, I had to jump out with a pole, and another man, and push them over, and I would run with the current so that I could run across the stream in less than a minute and unload my boat. It drew about eight inches of water when it was light—about the width of the bottom boards. We had a regular bottom and a false bottom in the boat. In regard to these steamboats that ran up and down the river and their capacity for freight and passengers, I will say, this was built in Cincinnati. It was a considerable size boat. The boatmen said it was built to run on a

heavy dew. The motive power was steam and it was a side-wheeler. Yes, sir, this boat carried freight and passen-
8464 gers. She came up loaded once. The next time she came up she was stuck at the mouth of the Wakarusa. On that trip she reached Moline. No, sir, I don't remember the length and width of that boat. It carried a large amount of passengers and a good deal of freight. At that time the boat ran on the river to Lawrence. She was built to go to Lawrence. No, she didn't for a number of years get up as far as Lawrence. She never made but one trip to Lawrence and then she went on to some other trade and never was seen in the river again. She couldn't get up. As to what other navigation there was on the Kaw river in those early years, I will say there was a boat made two trips up to Le Compton and loaded the mail for the territorial capital. The following night they put back in flat-boats and couldn't get down. They had to load it into wagons and haul it. That was a small steamer, and a side-wheeler too. There were maybe three or four side-
8465 wheelers on the river in those early years. There was some of them on the river before I got there. They made their trip up and one stayed there and got burned up with a prairie fire. No, sir, there was no considerable amount of boating up as far as Lawrence in those early years. The head of navigation then was Fort Riley, and that is about a hundred miles west of Lawrence. Fort Riley was then thought to be the head of navigation. But they never made but one trip and they had hard work getting back. As to whether I ever saw in those early years any other boating at Lawrence, whether by steam or flatboats that were pushed along and loaded with grain or provisions, I would say not anything after that that made that trip. There wasn't a boat that went up that river as far as Lawrence. She did make a trip up to the mouth of the Wakarusa and stuck. She was the last boat that was on that river.

Yes, sir, during the earlier years I mean there was a failure in Saline county. As to how those crops were from 1884 to
8466 1890, I couldn't say. I paid no attention to it at that time. I was too busy a man to pay much attention to it. I was in the general trade and was postmaster there for about twenty-seven years and I had just all I could do getting out. That year that I mentioned about Dry creek there was only a partial failure in Saline county. There was not a full failure, except in 1860, and I have my doubts about 1860 being a full failure, but it was a partial failure from the Solomon to a few miles west of Salina. As to whether there were partial failures from 1884 to 1890, I couldn't say. My memory is not good enough to remember that. That is too late. Yes, sir, I said that after the war the settlers came into our county just like a cloud of locusts. Just exactly. Most of them stayed. Some are dead and some are gone. It is a long while since then. It was in 1867 and 1868, and they are scattered over the country. No, sir, I never said that the bottom

lands now are not as good as the uplands. You never asked me any such question as that either. No such question was sug-
8467 gested to me. No, sir, I didn't say anything about the bottom lands being so good as they were because they were cut up. When you asked me about the first settlers I said they always took a bend where there was some timber on the poorest pieces of land, for the reason that it was cut up with rivers, where they could have taken a nice piece of land out in the bottom where there was no river or anything on it. Oh, yes, undoubtedly I still regard bottom lands as better than the uplands, particularly in our county. Yes, sir, that place where I raised fifty bushels of corn to the acre was in a low place. Yes, this other piece of low land. The creek overflows it. As to how far that was above the water in the creek at ordinary stages, I will say that creek don't have water in it in ordinary times. It is a dry creek. As to how far it was down to the water level, that is, to what some folks called the underflow, I would say down to the water in the wells there, as I said, when it was a wet year we got it at sixteen feet and then had to go deeper, and I have gone thirty-five feet, but not because I didn't strike water. There
8468 are two or three strata of water. As to how far it was to water where I grew that corn, I will say, in that case I couldn't tell for I never dug a well on it. But I suppose it is about twenty feet, probably. You see that is a different sub-soil and a different soil underneath there. As you go over toward the Smoky Hill where I dug the first well it is a different thing. It is sand clear down. After you go a short distance it is mixed sand. Yes, during the first year in digging these wells we went down from sixteen to eighteen feet. That was a wet year. And afterward I sank them down, yes, sir. One well I sank down ten feet farther. Yes, sir, that was the first well. I think we sank it deeper the next year, and we went about four feet to water. We wanted to have plenty of water. We had water when we sank it, but it made it muddy to draw it up. Yes, sir, during those earlier years when the river was dry, in 1860 and 1861, there was a general drouth throughout the country in both western Missouri and Kansas, and that drouth affected all the
8469 streams more or less and dried the streams up quite generally in western Kansas, and I suppose likely in eastern Kansas too. Yes, sir, there were a good many buffaloes in the country at times then. Sometimes the country was covered with them and sometimes there were none in sight. No, the drouth did not drive the buffaloes out of the country in those years. The buffalo pays no attention to drouth. As to whether there was water enough for the buffaloes for drinking purposes, I will say that there were more or less springs that they knew of and they followed the trails to them and got water, and they kept travelling. They would go north and south at two different seasons of the year.

I first saw the Arkansas river in 1859 just across from the old crossing of the Walnut. No, sir, I didn't see the river during 1860 or 1861. I didn't see it during those dry years. I was not over there

in those dry years. I was over there in one dry year. I went over to get my wife on the Santa Fe road, and they had beautiful corn there and we hadn't any. That was on that branch that is built from—one branch of the Santa Fe through McPherson. It was not
8470 finished but to Lyons, and I took a carriage from Lyons and drove over to the nearest point on the road, I couldn't tell now where it was. It was the nearest point to Lyons from that Santa Fe branch to the main line of the Santa Fe. It was the western end of the road at that time. Yes, sir, I said the streams have been very low since 1873—the Smoky and the—— As to what years these streams had very little water in them in recent times, I will say these years of the steamboating I was telling you about you couldn't go to—— In 1863 was the last year I saw the river dry, and I have not noticed it low since that time, and I am living right on the bank of it too. There is one thing, we have a dam for a mill. We never could run any mills on these streams in those early days. There is more water in the streams now, and consequently I don't notice just a few inches. The stream always runs in these days; it didn't in those days. The highest water I ever saw in
8471 the river was in 1858. Yes, sir, I saw the Kaw during the flood of two years ago. I was right here. No, I never saw the water higher than during that freshet. The Indians reported to me right across here it was a good deal higher in 1858 than it was then. It was two and a half feet higher in 1858 at my nearest neighbors there than it was in 1903. 1903 was the highest I have seen it here at this point. But I understood it had been higher in 1858. Up at my place it was higher. I think I did see the river in 1858. I was right on it, and I say it was higher in 1858 than it was in 1903. Yes, sir, it was decidedly higher in 1903 than at any time between 1858 and that time. Decidedly higher,
8472 yes, sir. Yes, sir, the flood of 1903 was a very destructive flood and the waters were very high in the Kaw river and they remained up for a considerable period of time—probably a week or ten days. Yes, sir, the water was very much higher in 1903 than in 1904. In our country it was. No, I didn't see the river down here in 1904. Yes, sir, we had a flood in that year, but I don't know how long it lasted. I think up at our place about two days.

Redirect examination.

By Mr. LOOMIS:

Yes, sir, I spoke of going to the Arkansas river for my wife and seeing the corn growing there. The corn was growing there only in the Arkansas valley. On the hills there wasn't any. I had to go over the sand hills to get to this place, and this place was a point on the line of the Santa Fe road. The road is just one town
8473 west of it now. Yes, sir, I did go over to the Arkansas valley at that time, and there was no corn growing that we could see until we got into the Arkansas valley, no, sir. As to how

the corn was looking at that time, oh, it was beautiful. We were perfectly astonished. I ought to remember the year in which that was. It was the year Mr. Hyde died. Whether it was 1881 or 1882 I couldn't remember. I wouldn't say. The crops were all dried up in our country. Yes, sir, it was the year Mr. Charles Hyde died. Yes, sir, I took the railroad from Salina to go south there. I took the railroad to McPherson and then went to Lyons and drove across from there to the Arkansas river to the main line. After we left Lyons until we struck the Arkansas valley, yes, sir, we saw corn. There was dead corn, but that is all. The corn had grown in the early part of the season and it was dead then.

8474 CYRUS ANDERSON, Topeka, Kansas.

Direct examination.

By Mr. LOOMIS:

I have lived in Kansas forty-eight years. I first settled in Miami county. I lived there until 1880 when I moved to Lawrence county, where I now reside, and that is in the northwest corner of the State. At the present time I am secretary of the board of railroad commissioners. When I went to Lawrence county I was a ranchman and farmer, and I have owned land in that county since 1880. Yes, sir, I have been engaged in agriculture and stock raising to a greater or less extent all the time—sometimes more and sometimes less. Yes, sir, I think I am familiar with that country and its capacity for raising crops. I am acquainted with the streams west of the
8475 100th meridian to the two northern tiers of counties. The streams I am acquainted with are the Beaver, the Republican and the Prairie Dog, particularly. The Beaver and the Prairie Dog are tributaries of the Republican. I have been acquainted with those streams ever since 1880 and have observed the flow of the water in them from year to year. As to the flow of the water in those streams during the last ten years as compared with the first ten years (objection), I will say the flow has been just the same—
8476 more regular, that is, they have been perhaps not as—well, more regular, I would say. I can't say that the flow is any greater but it is more regular. The streams are not dry as great a number of times as prior to that. No, sir, not from my observation has there been any falling off in the mean annual flow of the waters of those streams. The country when I first settled there was settled very limited. The first settlers came there in 1879. At the present time there are about 7,000 people in the county. As to the capacity of the soil for raising crops on the bottom lands in my county as compared with the early settlements of the county, say in the '80's, I will say it is just the same. I don't see but what the bottom lands produce just as well now as they did in the early settlement. The bottom lands were settled first, before the uplands.

As to the cause of that, on the bottom lands it was nearer to water and up in those counties on some of the streams there was timber, but I would say water facilities, and of course the land was more moist. As to the fertility of the bottom lands as compared
8477 with the uplands, well, for corn it is better than the upland. For wheat, what we call west of the 100th meridian. I would say what we call the table lands, that is, the level land, it would be about the same. Of course the bottom lands are much better than the rolling uplands, which we call the "brakes."

Cross-examination.

By Mr. HAYT:

Yes, sir, we have raised considerable corn upon the upland in the last seven or eight years. I would say we have had pretty good crops the year before last, and there is a fine crop up there this year. Last year it was not so good. I should say that the average for the last four or five years would be that three crops out of five have been good. Yes, sir, the bottom lands hold the moisture better than the uplands. That is true in our part of the country.

8478 W. H. MITCHELL, Topeka, Kansas.

Direct examination.

By Mr. ASHBAUGH:

I live at Beloit, Mitchell county, Kansas. I went there in 1872. That is on the Solomon river. The Solomon river flows the whole length of the county. I know the lands in Mitchell county and the rivers flowing through it pretty thoroughly. I have been over the county considerably. I kept a hotel from 1872 to 1878 at Beloit, and I was postmaster twelve years after that there. I am engaged in farming somewhat. I own a few farms in the county. I have seven—six of them in Mitchell county and one on the edge of Jewell county, which is just north of Mitchell county. I have lived six or eight miles from the Solomon river. At first I
8479 lived right on the banks of the Solomon. I have no land that is absolutely in the bottom. They are on the uplands. I have lands that are creek bottoms—small creeks. As to how the flow of the Solomon river, exclusive of extreme floods, compares in these later years with its flow, exclusive of floods, in the earlier years (objection), I think the flow is greater now. The average annual flow is greater than it used to be when I first went there. As to how deep we have to go for water along the Solomon (ob-
8480 jection), in the Solomon valley I should judge you would have to go from twenty to thirty feet in some places. As to whether the depth to which we go for water has changed in the later years, I think not. I don't know of anyone who has had to dig deeper. I know of several wells that were dug in the earlier

years where they didn't get water that have plenty of water in them now, on the uplands.

As to what part of our county was settled first, I will say the bottom lands. They thought that they were the best. On the average, I think they are more productive than the uplands. As to how the productiveness of those bottom lands in the later years would compare with the productiveness of the same lands in the earlier years under similar conditions, I think they produce just as much as they ever did. If the agricultural reports show in Mitchell county and in other counties adjoining that they are similarly situated that as to certain crops there is a falling off in the average yield per acre, as to how I explain that, I will say the better lands were taken up first and then they had to go onto the uplands and onto the table lands as we call them, or hills, where the land is not as good, and

8481 that would decrease the average. Yes, sir, that would decrease the average yield per acre as shown by the reports. That is true in other counties around Mitchell county so far as I know. I think Ottawa and Lincoln and Cloud counties are similarly situated with respect to those rivers and valleys as Mitchell county. The general conditions in the counties around Mitchell county I think are about the same as in Mitchell county. (Objection.) As to how extensively I have been over Ottawa, Lincoln, Russell, Osborne, Smith, Jewell and the Republic counties, I will say I have not been generally over those counties but have been in

8482 each of them many times, yes, sir. I have not been along the rivers in these different counties with any idea to warrant me in saying I could remember anything about it. As to the general lay of these counties as compared with the appearance of the land in Mitchell county, we think the Solomon valley is the widest valley, taking it from its mouth to its source, of almost any valley in the State. I think Mitchell county is really better—Ottawa and Mitchell. The bottoms are wider—the Saline bottoms—than in Lincoln or Russell or Osborne counties. Osborne has some wide bottoms, but the river divides before it gets into Osborne county and becomes two rivers up there. As to the width of the first bottom or the Solomon river valley as confined to the first bottoms there in Mitchell county, I will say it varies much. The table lands come down on one side or the other close to it. The valleys of what we would call the first bottoms would run from half a mile to four or five miles, perhaps, in places. On an average, the

8483 width would be a couple of miles, perhaps. Somewhere in that neighborhood, from my observation. I should think in the others they are somewhat narrower. I don't know enough of the other streams to say that they correspond with ours, but I have kept pretty close watch of the Solomon river. (Objection.) Yes, sir, I live right in sight of it now and have lived right in sight of it ever since I have been there, and have been in daily observation of the Solomon river for thirty-three years, excepting the time

I was in the lumber business for two years at Arkansas City. Yes, sir, I retain my home in Mitchell county.

8484 I am mayor of Beloit at the present time. I am serving my third term. I have been postmaster for twelve years there, and have held various minor positions.

Cross-examination.

By Mr. HYAT:

Yes, sir, I said I thought there had been an increase in the flow of the river. As to what I attribute that to, my judgment would be that it is perhaps a gradual western trend of the rain belt. The rain is more than it used to be when I first went there. I think the lands that have been broken up and tilled hold the water and have a tendency to keep up the flow of the river, that is, to hold the water back in its flow and let it out gradually. That is my opinion about this. As to what information I have with reference to Ot-

8485 tawa county, I have nothing more than going over it a good many times a year back and forth. The Solomon Valley road runs through it the whole length of the county down the river. In reference to Russell county, I have been there a few times in the last few years. But as to having travelled over any considerable portion of it, I only go through it by rail. I guess I haven't been there more — twice in the last two years. I guess I drove over once, though, a couple of years ago, across through Lincoln and into Russell. I took the Kansas Pacific railroad on my last trip through Russell county. No, sir, I didn't make any particular observation with reference to the crops, I suppose, upon that trip. As to Smith county, from my own personal observation, I go through Smith county often when I go up the North fork of the Solomon, through the south part of it, and I have been over the Rock Island several times. I drove across the country once. That was two years ago. I have been across it by rail probably four times—four or six

8486 times in the last two or three years. Years ago we used to go by team. As to whether on these trips by rail I particularly observed the crops, I would say not more than one ordinarily would who is in the farming business. He is always looking out for those things a little. And that extended over two lines of railroad—the Missouri Pacific and the Rock Island. One runs through the central or northern part of the county—that is, the Rock Island. In regard to Jewell county, well, I am quite well acquainted with Jewell county. I have been much more in that county than in Osborne or Smith. As to Cloud county, I go through that on two or three different lines of road. As to Lincoln county, I am not so much in Lincoln county, no, sir. The last time I was in Lincoln

8487 county was two years ago, I think. I was passing through there on the railroad and talking about politics. I think it is true, sir, that I gave my attention more to politics on that

trip than to observing the country. As to the crops upon the farms that I own for the last five or six years as compared with the crops for previous years, as a whole, I think they have been better during the last seven or eight years, yes, sir. Yes, I think on the whole during the last seven or eight years the crops are an improvement over previous years. It depends much on who you have on your place, though, and how well it is cultivated. As to whether as the years go by my land comes to a better state of cultivation, I
8488 don't know about that. It goes back very fast if you get a poor man on it.

I attribute the increase in the productiveness in the last seven or eight years to both improved cultivation and more rainfall. Yes, sir, we have had a good average rainfall in that locality for the last seven or eight years. Yes, I think a greater amount of rainfall will be absorbed by the land after the buffalo sod has been broken up and the land is in cultivation than prior to the time the sod was broken up. That is generally true.

8489 R. A. BURCH, Topeka, Kansas.

Direct examination.

By Mr. LOOMIS:

I now reside at Topeka, Kansas. My home is in Salina. I am a justice of the supreme court of the State of Kansas. I have lived in Salina since the fall of 1869. I am acquainted with Mr. A. M. Campbell, and have known him during the period of my residence there. I was acquainted with Mr. Charles E. Hyde of whom Mr. Campbell testified and who is now dead. He was a banker. Yes, sir, I recall his death. He died away from his home. It was either in Colorado or New Mexico. He had gone West for his health. I can fix the date of his death within the limits of a year or two. I should say the date of his death was some time between the spring of 1880 and the spring of 1882.

8490 Mr. MILLER: The State of Colorado moves *out* to strike out the following evidence offered in rebuttal, to-wit:

1. All evidence objected to on the ground that the same was not proper rebuttal evidence.

2. All evidence finally elicited from witnesses by leading questions after failure to obtain the same by direct questions, the witnesses being friendly to the State of Kansas and citizens of the State of Kansas.

3. All evidence in reference to underflow.

4. All evidence in reference to the narrowing of the channel of the Arkansas river and the formation of islands in the same.

5. All evidence in relation to decrease in crops on the bottom lands.

6. All evidence in relation to the lowering of water in wells except so far as the same relates to the checking up of surveys made by the State of Colorado and put in evidence as part of the defendant Colorado's case.

7. All evidence in relation to the filling up of the channel of the Arkansas river, thus causing overflows.

(Intervenor's Exhibits 17 and 18, being certified copies of rainfall records at Dodge City and Wichita, introduced in evidence.)

ORDER OF THE EVIDENCE.

Party.	Pages of original record.	Pages of abstract.
Complainant (evidence in chief)	1–2028	251–616
Defendant Colorado	2037–3589	617–977
Defendant The Graham Ditch Company	3590–3596	977–979
Defendant Colorado (continued)	3597–3784	979–1021
Intervenor	3785–5431	1022–1427
Defendant The Arkansas Valley Sugar Beet and I. R. Co.	5432–5505	1428–1454
Defendant Colorado (concluded)	5506–6969	1455–1858
Complainant (evidence in rebuttal)	6970–8491	1859–2286

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		COMPLAINANT'S EXHIBITS.	
5	1	Photograph of wooden bridge over Arkansas river at Wichita, Kansas, taken in summer of 1878	252
9	2	Photograph of iron bridge over Arkansas river at Wichita, Kansas, erected in 1879	253
10	3	Photograph of same bridge, taken at a later time	253
289	4	Certified list of 500 quarter sections of land bordering on Arkansas river, between Arkansas City and Hutchinson, giving date of entry and of patent in each case, and showing these tracts of land were entered and patented between the years 1870 and 1876	305
472	5	Record of mean monthly discharge of Arkansas river, furnished by United States Geological Survey, from earliest record down to and including 1903	334
7887	5½	Record of the Geological Survey showing mean monthly and annual flow of Arkansas river for 1904, to be considered in connection with Complainant's Exhibit 5	2125
841	6	Photograph of steamboat "Aunt Sally," taken July 4, 1878	383
1044	6½	Copy of charter of Arkansas City Water Power Company, filed for record December 17, 1880	415
1049	7	Photograph of tail-gates of Arkansas City canal, taken in 1881	416
	8	Photograph of Arkansas City canal, taken in 1881	416
1323	9	Map of United States Government survey showing Arkansas river to be a meandered stream through Edwards county, Kansas	470
	10	Map of United States Government survey showing Arkansas river to be a meandered stream through Pawnee county, Kansas	470

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	37	Colorado State engineer's record of flow of the Apishipa river for 1900, 1901, 1902, and 1903	526
	38	Colorado State engineer's record of flow of Fountain creek for 1900, 1901, 1902, and 1903	526
1636	39	Copy of deed of State reformatory at Hutchinson, Kansas, executed August 14, 1885	529
	40	Copy of United States statute conveying soldiers' home at Dodge City, Kansas, to State of Kansas	529
1637	41	Photograph of bridge across Arkansas river at Wichita, Kansas, taken September 16, 1904	529
1644	42	Photograph of Fort Lyon dam at La Junta, Colorado, taken August 24, 1904	531
1647	43	Photograph of Fort Lyon headgate at La Junta, Colorado, taken August 24, 1904	532
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	48	Copy of charter of Great Eastern Irrigating, Water Power and Manufacturing Co., filed for record October 8, 1880	577
	48½	Copy of charter of Western Irrigating Co., filed for record August 27, 1881	577
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Albert, J. O	Colorado	3771	1019
Alexander, Joseph L. B	Intervenor	4841	1264
Anderson, Cyrus	Complainant	8474	2281
Anderson, Thomas	Complainant	8437	2269
Argabright, Charles E	Colorado	5679	1516
Atkinson, S	United States	4229	1124
Baird, James	Colorado	3497	957
Baldwin, Frank D	Colorado	2519	743
Barber, E. P	Kansas	7014	1872
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Baxter, Oliver H. P	Colorado	3009	857
Beal, James	Kansas	8169	2199
Beaman, D. C	Colorado	2456	729
Beatty, J. W	Colorado	3165	891
Beatty, Wm. R	Colorado	2698	786
Beackham, Henry C	Colorado	2947	845
Beeson, C. M	Kansas	1262	457
Belden, S. M	Colorado	6511	1726
Bell, H. B	Kansas	1341	472
Bell, Theodore A	United States	4476	1175
Benedict, James	Kansas	910	396
Bent, A. E	Colorado	3575	974
Berthoud, Edward L	Colorado	2673	779
Best, Humphrey	Colorado	3207	902
Bidleman, Robert A	Colorado	5985	1593
Bigger, L. A	Kansas	7793	2100
Block, Henry	Colorado	5506	1454
Bobenreith, Charles	Colorado	3570	973
Bonsall, I. H	Kansas	839, 853, 1045	383, 415
Bott, Anthony	Colorado	2832	818
Bourne, Henry H	Colorado	3098	878
Breese, D. E	Kansas	199	293
Brinkman, William H	Colorado	5899	1570
Brodie, Alexander O	United States	4820	1259
Brown, J. R	Colorado	6248	1660
Brown, Ransom H	Kansas	148, 8009	286, 2159
Bridgeman, Frank	Kansas	8132	2190
Buffington, J. M	Colorado	6767	1789
Burch, R. A	Kansas	8489	2285
Burtis, A. H	Kansas	6970	1858
Caldwell, A. B	Kansas	662, 729	353, 364
Campbell, A. M	Kansas	8451	2273
Campbell, B. H	Kansas	473	334
Capps, S. J	Colorado	3735	1010
Carey, Joseph M	United States	5097	1324
Carpenter, Louis G	Kansas	1618	525
Carpenter, Louis G	Colorado	2037, 2566, 6831	617, 755, 1805

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Carson, W. G.	Colorado	6664	1762
Catrin, Thomas B.	United States	4085	1091
Chambliss, H. D.	Kansas	1377	479
Chapman, David D.	United States	4998	1304
Chapman, G. L.	Kansas	7566	2038
Chew, E. R.	Kansas	1437	491
Clark, Gibson	United States	3890	1047
Coburn, F. D.	Kansas	8427	2266
Code, W. H.	United States	5057	1315
Collins, Charles	Kansas	7843	2115
Cone, Rufus	Kansas	8083	2178
Conley, Lewis	Colorado	3019	859
Cornell, W. B.	Kansas	7522	2026
Corthell, Nellis E.	United States	3832	1034
Cowie, James	Kansas	1631	528
Craig, James	Kansas	1951, 7079	597, 1891
Crane, R. S.	Colorado	5609	1500
Cressy, S. W.	Colorado	3171, 3324	892, 923
Crittenden, Harry S.	Colorado	3441	947
Cubbon, G. T.	Kansas	8092	2180
Culberson, A. N.	Colorado	6162	1640
Curran, F. G.	Colorado	3310	920
Darton, N. H.	United States	4810	1256
Dawson, John S.	Kansas	8413	2262
Denton, Albert H.	Kansas	887	393
De Weese, Dall	Colorado	2911	837
Dickson, G. N.	Kansas	728	364
Dickinson, S. S.	Kansas	7391	1983
Diesen, I. L.	Kansas	1853	574
Dixon, Joseph M.	United States	4571	1196
Dofflemyre, F. M.	Colorado	6378	1690
Donahue, John J.	Colorado	3459	950
Dotson, L. B.	Colorado	6603	1749
Doughitt, A. P.	Kansas	8322	2236
Doughty, J. K.	Colorado	3376	935
Downey, S. C.	United States	3882	1045
Drake, L. P.	United States	4974	1298
Dubois, Fred T.	United States	4541	1190
Dunton, Walter B.	United States	3975	1069
Edwards, R. E.	Kansas	1093	424
Emery, O. C.	Kansas	1637	529
Epperson, E. E.	Colorado	6015	1600
Evans, Charles F.	Colorado	3313	921
Evans, R. W.	Colorado	5634	1505
Fellows, A. L.	United States	3948	1061
Finley, Robert	Colorado	2826	817
Finn, William	Kansas	7997	2156
Folsom, O. V.	Kansas	2000	610
Fosdick, H. M.	Colorado	3151	888
Foster, George	Colorado	6120	1630

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Foster, J. R.	Colorado	6211	1651
Foster, Luther	United States	4030	1079
Franey, P. K.	Kansas	747, 1047	367, 416
Frederickson, C. J.	Colorado	2938	843
Frizell, E. F	Colorado	5845	1557
Fullington, C. P	Kansas	501	349
Galbreath, Henry T.	Colorado	2737	794
Gallagher, S., Jr.	Kansas	1358	475
Gallena, James	Colorado	2789	807
George, Joseph S.	Kansas	7835	2113
Gibson, Frank	Colorado	5972	1588
Gilbert George	Colorado	2977	851
Gobin, William B	Colorado	3117	882
Gores, John	Colorado	3430	945
Greene, Arthur H.	Kansas	1020	412
Griggs, Millard F.	Kansas	2004	611
Hadley, L. T.	Colorado	6103	1626
Hagerman, J. J.	United States	4331	1147
Hahn, Henry	Colorado	6755	1785
Hahn, Joseph.	Colorado	6798	1797
Hall, B. M.	United States	4285	1138
Hall, J. M.	Colorado	6425	1703
Hamilton, William G.	United States	4234	1125
Hamm, G. R.	Colorado	6749	1784
Hansbrough, H. C.	United States	4612	1206
Hansen, H. H.	Kansas	151, 238, 8075	286, 299, 2176
Harrison, John W	Kansas	52	273
Hart, Claudius V.	Colorado	3684	998
Hartford, Henry	Colorado	7787	2090
Healy, P. V.	Colorado	8159	2196
Hegwer, Henry	Colorado	2536	749
Heller, William A.	Kansas	7488	2015
Henry, T. C.	Colorado	2313	694
Herzer, Charles.	Kansas	7160	1914
Hess, Frank J	Kansas	1024, 1075	412, 421
Hill, George	Colorado	5587	1494
Hill, L. H.	Colorado	6789	1795
Hillier, G. R.	Graham Ditch Company	3590	977
Hirst, Samuel	Kansas	7720	2082
Hogbin, D. E.	Colorado	5550	1489
Houser, Walter N.	Colorado	3661	993
Hoyt, E. J.	Kansas	997	408
Huss, W. O.	Kansas	118	228
Hudson, Edward H.	Kansas	7087	1893
Huston, Edwin	United States	4980	1300
Imel, James M.	Kansas	7338	1968
Irwin, Rueben	Colorado	3352	930
Jackson, John	Kansas	8279	2224
Jewell, W. D.	Colorado	6143	1635

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Johnson, Clyde B	Kansas	7477	2012
Johnson, Samuel N	Colorado	3614	983
Johnson, Willard D	United States	4675	1221
Johnson, W. J	Colorado	3562	972
Johnson, W. H	Kansas	7379	1980
Johnston, Clarence T	United States	3785	1022
Johnston, J. R	Kansas	8274	2222
Johnston, M. R	United States	3936	1059
Jones, W. L	United States	4459	1172
Jones, William W	Colorado	3505	959
Juneau, H	Colorado	5752	1533
Jurgensen, Henry	Kansas	100	279
Keeley, J. B	Kansas	7631	2057
Keep, E. N	Kansas	1930	592
Keller, Johnson	Kansas	796	375
Kincaid, Joseph K	Colorado	3726	1008
Kreybill, Frank	Colorado	3338	927
Laird, George C	Kansas	1400	484
Lambert, Jacob	Colorado	6497	1722
Larmor, Dan	Colorado	5536a	1462
Lawrence, R. E	Kansas	375	318
Leasure, Emma	Colorado	5883	1566
Lemasters, S. D	Colorado	6679	1766
Lewis, Hiram W	Kansas	652	351
Lewis, John F	Colorado	6022, 6051	1603, 1612
Lewis, J. F	Kansas	7623	2054
Loehbough, Henry	Colorado	6271	1666
Logan, J. S	Colorado	2939	844
Longstreth, C. S	Kansas	1894	582
Loucks, C. A	Kansas	1936	593
Loughlin, Simon H	Colorado	6477	1717
Lull, P. F	Colorado	3044	865
Luna, Solomon	United States	4164	1109
Lynch, J. B	Colorado	3331	925
McAdams, Charles E	Kansas	290	305
McAllister, Henry	Colorado	2845	822
McBeth, I. N	Kansas	7093	1895
McCanless, D. A	Kansas	615	344
McCanless, James A	Colorado	2955	847
McCoy, Joseph G	Kansas	8100	2182
McDowell, Harry H	Colorado	3538	967
McGee, J. M	Kansas	7715	2081
McMillan, Marsena J	Colorado	3557	970
Macdonald, Jesse F	Colorado	3700	1002
Mains, W. F	Kansas	8301	2230
Malone, W. G	Colorado	6233	1656
Mathewson, William	Kansas	7973	2160
Maxwell, George H	United States	4405	1163
Mead, Elwood	United States	5232	1363
Mead, J. R	Kansas	7894	2127

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Miller, J. B.	Kansas	7588	2045
Miller, J. H.	Kansas	7145	1910
Mills, M. W.	United States	4057	1085
Mitchell, W. H.	Kansas	8478	2282
Monahan, Deane	Colorado	2687	784
Mondell, Frank W.	United States	4493	1179
Morgan, M. E.	Kansas	8109	2184
Morrill, Ernest C.	Colorado	6690	1771
Moses, George N.	Colorado	5948	1582
Mulvey, Oliver.	Kansas	18	267
Murdock, M. M.	Kansas	1, 537	251, 255
Murphy, John A.	Colorado	3365	933
Murray, M. H.	Colorado	3346	929
Myrtle, John	Kansas	830, 1018	380, 411
Needham, J. C.	United States	4596	1203
Neff, Elias	Kansas	1016	411
Nesbit, J. J.	Kansas	7485	2014
Newcomb, C. Q.	Kansas	7543	2032
Newell, F. H.	United States	4846	1265
Newman, A. A.	Kansas	1050	416
Newton, Harris A.	Colorado	2705	788
Nixon, Moses.	Colorado	6739	1781
Nolan, Berry W.	Colorado	5537	1465
Norris, W. B.	Colorado	5962	1586
Northrop, Charles H.	Kansas	7198	1925
Otero, Miguel A.	United States	4016	1076
Overley, J. S.	Kansas	8222	2210
Overton, Earlie.	Kansas	7061	1886
Packer, J. O.	Colorado	3642	989
Paddock, J. C.	Colorado	3755	1015
Parish, A. Newton	Colorado	3524	963
Patterson, Jeremiah	Kansas	8338c	2241
Patterson, W. R.	Kansas	2012	612
Patton, R. A.	Kansas	731	364
Payne, T. G.	Colorado	5819	1551
Pennington, A. D.	Colorado	6807	1800
Perea, Pedro.	United States	4148	1105
Perry, William A.	Colorado	2731	793
Pettijohn, L. J.	Kansas	1318, 7114	469, 1902
Phillips, E. W.	Colorado	6724	1777
Pierce, F. L.	Kansas	1685	542
Pierce, John	Colorado	2953	846
Ploughe, Sheridan.	Kansas	7765	2092
Poe, J. W.	United States	4217	1121
Poovey, W. H.	Kansas	8185	2202
Potter, H. W.	Colorado	3307	919
Pratt, Albert.	Kansas	7041	1880
Price, T. C.	Colorado	6821	1803
Pyle, E. J.	Kansas	1812	586
Pyles, T. B.	Colorado	2863	827

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Randall, W. N.	Colorado	3231	906
Reid, Wendell, M.	United States	4181	1113
Reeder, W. A.	United States	4644	1214
Reeve, George H.	Kansas	1756	554
Righard, George W.	Kansas	1412	486
Rich, Paul	Colorado	3487	955
Riney, John	Kansas	7120	1903
Roberts, Robert	Colorado	2714	790
Rodey, B. S.	United States	4362	1156
Rogers, John	Colorado	6008	1598
Ross, John	Colorado	2961	848
Rowan, W. McD.	Kansas	6981	1861
Rupert, John H.	Kansas	7598	2048
Rush, Joshua	Colorado	6406	1699
Rutledge, Silas	Kansas	257	302
Sager, Henry B.	Colorado	3597	979
Sanderson, Harley	Colorado	3088	876
Schaefer, Charles	Colorado	6343	1682
Schmidt, C. B	Colorado	3053	867
Schnack, Peter	Colorado	5835	1555
Schneider, C. A.	Kansas	2028	616
Swartz, H.	Kansas	7696	2075
Sharp, Clinton B.	Colorado	3649	990
Sheldon, A. Z.	Colorado	2881	831
Shidelar, Thomas	Colorado	2905	836
Shive, G. M.	Kansas	243	300
Shive, John W.	Kansas	322	309
Shore, A. J	Colorado	6633	1756
Shore, W. L.	Kansas	8204	2206
Sibert, William L.	United States	4961	1295
Sidlow, John D.	Colorado	5653	1510
Simpson, O. H.	Kansas	7180	1919
Sites, J. T.	Colorado	6587	1745
Sites, J. R	Colorado	6461, 6534	1711, 1733
Sites, J. W	Colorado	6570	1741
Sitlinger, John R.	Colorado	2893	834
Sleeth, William M.	Kansas	843, 1039	388, 415
Slichter, Charles S.	United States	5140	1334
Smith, S. S.	Colorado	3109	880
Smith, J. H.	Kansas	7667	2066
Sommerville, Jasper	Kansas	8243	2215
Speers, W. H.	Kansas	969	404
Spencer, B. D.	Colorado	2813	813
Spencer, William J.	Colorado	5715	1524
Sprankle, D. M.	Colorado	6171	1642
Stambach, F. M.	Kansas	8057	2172
Stauffer, Oliver B.	Colorado	3212	903
Steele, J. M.	Kansas	8289	2227
Stevens, Squire	Kansas	8261	2220
Stevens, W. F.	Colorado	6188	1646

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Stevenson, R. J	Kansas	945	401
Stillwagon, Jacob	Kansas	1734	549
Stocker, Owen B	Kansas	7965	2148
Stocks, B. F	Kansas	5576a	1975
Stotts, E. B	Kansas	1981	605
Sullivan, Vernon L	United States	4262	1132
Sutton, M. W	Kansas	1393	482
Swanson, F. W	Colorado	2759	800
Swarens, A. A	Colorado	6067	1617
Swink, George W	Colorado	3241	908
Taylor, Daniel L	Colorado	3710	1004
Timmons, Joseph	Kansas	7277	1949
Thoman, C. P	Colorado	3392	938
Thomas, John J	Colorado	2990	853
Thomas, S. H	Kansas	7250	1940
Thompson, G. W	Colorado	3622	985
Thompson, John	Colorado	6764	1788
Thorp, A. A	Colorado	5920	1575
Thurlow, Silas	Kansas	8310	2232
Todd, Jesse J	Kansas	7888	2126
Tracy, Francis G	United States	4265	1133
Tucker, S. M	Colorado	6301	1674
Tupper, C. E	Kansas	135	284
Twitchell, R. E	United States	4110	1097
Tyler, Edwin	Colorado	6033	1606
Unruh, T. B	Kansas	7608	2050
Van Frank, P. R., Jr	United States	5029	1309
Van Orsdel, J. A	United States	3921	1055
Veale, G. W	Kansas	8353	2246
Vernon, William H	Kansas	1181, 1194	441
Vincent, Frank	Kansas	7736	2085
Warren, Francis E	United States	4935	1289
Watson, George W	Kansas	7864	2119
Watson, William A	Colorado	3092	877
Watz, C. W	Kansas	8066	2174
Weeks, Nathan F	Colorado	5577	1492
Welchons, Daniel	Colorado	6082	1621
Wellman, Floyd E	Kansas	1151	435
Wiggins, Oliver P	Colorado	2495	738
Wiley, W. M	Ark. Val. S. B. & I. L. Co.	5432	1427
Williams, John	Colorado	6446	1707
Williams, L. D	Colorado	5997	1596
Wilson, F. D	Colorado	6045	1610
Wilson, Hill P	Kansas	8380	2253
Winters, Oscar L	Colorado	6539	1734
Withers, Granville G	Colorado	3048	866
Woodin, L. E	Kansas	878, 1069	391, 420
Worden, L. P	Kansas	1785	560
Worrell, J. P	Kansas	7498	2018
Wright, Robert N	Kansas	1197	444
Young, P. H	Kansas	7303	1957